Pit and Quarry

SAND ▪ GRAVEL ▪ STONE

HANDLING ▪ CRUSHING ▪ SCREENING ▪ WASHING

The Source of Reference

YOU have often wanted to prove your statement, refreshen your memory or add to your store of knowledge. Pit and Quarry HAND BOOK is carefully designed for this purpose, giving complete service and information to the pit and quarry industries.

Use the HAND BOOK when you want data on methods, production or equipment.

Pit and Quarry

HAND BOOK

RAND-McNALLY BLDG., CHICAGO

August 1, 1925

Index to Advertisers - - - - - - - Page 39
Table of Contents - - - - - Page 41

Circulation 7,600

An Outstanding Achievement
at an Astonishingly Low Price

Write for Book 120!

INDUSTRIAL
CRAWLING TRACTOR CRANES

INDUSTRIAL WORKS · · · BAY CITY · MICHIGAN

What one concern found out about DEPRECIATION

Every quarryman wants equipment that *stands up*— that holds its value and its usefulness.

There's just one sure way to protect your shovel investment against QUICK SHRINKAGE. Buy right, in the first place!

"What will my shovel be worth a year from now?" **was the question that worried this buyer.**

"Frankly, we feel it necessary to secure dependable facts on the depreciation of a shovel in rock work, before we purchase," wrote one New England firm.

"In a quarry near here there has been a shovel, not an ERIE however, which after 8 months' unsuccessful effort to dig rock was sold for $4,500 less than its purchase price. The loss of value was 5⅛% per month, or 61% per year. I want no such loss of investment value in our own case."

The "shrinkage of value" in this instance is shown by the chart at the left.

ERIE'S **depreciation *only about 6% a year,* handling rock.**

We sent this firm many records of ERIES which have worked in quarries year after year, and included the following letter from Tulsa Stone Co., Tulsa, Okla.:

"This ERIE has worked in our quarry every week day for seventeen months— mostly day and night shift. Based on a ten-hour shift, the shovel worked 1,164 days.

"After the equivalent of *four years'* operation this ERIE shows a depreciation not exceeding 25%, or 6¼% *per year,* and stands a grim giant ready for four years more of exacting service."

Make your own comparison of the losses in shovel value described by these two letters, and shown by the charts.

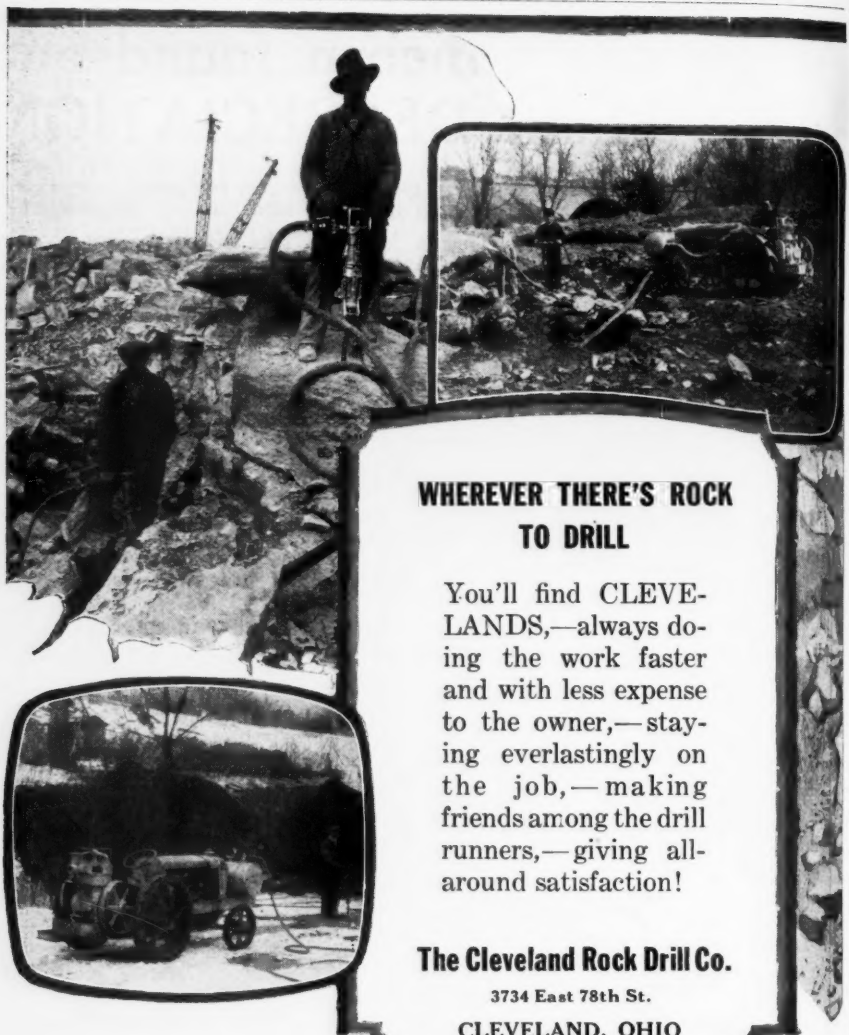
And remember that these are not extreme cases. You can find such contrasts for yourself, wherever power shovels are doing real work.

The unique sturdiness of the ERIE assures you of steady service, and also *protects your investment.*

ERIE STEAM SHOVEL CO., Erie, Pa., U. S. A.

ERIE Revolving Shovels

Builders of ERIE Shovels, Cranes, etc.
Branch Offices: Boston, New York, Philadelphia, Pittsburgh, Atlanta, Chicago. Representatives throughout the U. S. A.



WHEREVER THERE'S ROCK TO DRILL

You'll find CLEVELANDS,—always doing the work faster and with less expense to the owner,—staying everlastingly on the job,—making friends among the drill runners,—giving all-around satisfaction!

The Cleveland Rock Drill Co.
3734 East 78th St.
CLEVELAND, OHIO

CLEVELAND ROCK DRILLS

BRANCH OFFICES

CHICAGO, ILL.
605 S. Dearborn St.

NEW YORK CITY
30 Church St.

NEGAUNEE, MICH.

DETROIT, MICH.
428 Insurance Exchange Bldg.

ST. LOUIS, MO.
2091 Railway Exchange Building

PHILADELPHIA, PA.
The Bourse Bldg.

BIRMINGHAM, ALA.
403 N. 24th St.
Box 2028

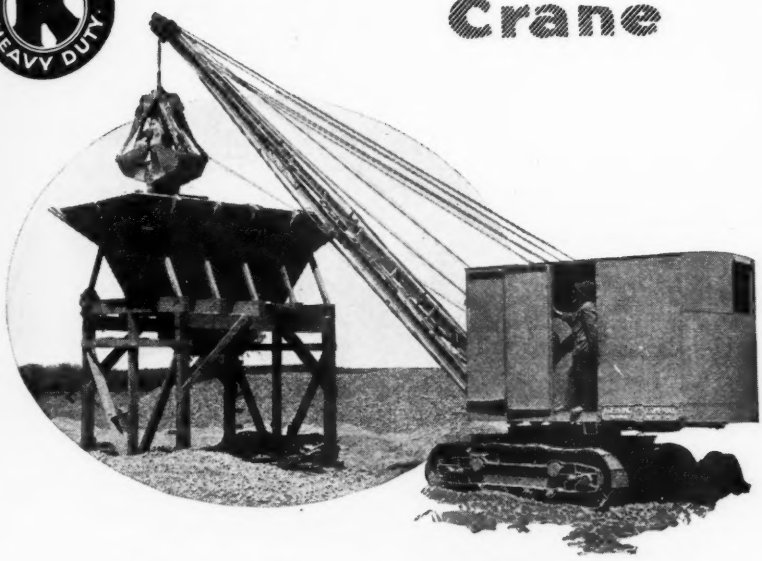
BOSTON, MASS.
113 Pearl St.

PITTSBURGH, PA.
922 Farmers Bank Bldg.

Canadian Trade Supplied by The Cleveland Pneumatic Tool Co. of Canada, Ltd., Toronto, Ontario
British Representatives, John McDonald & Co., Pollokshaws, Glasgow, Scotland.

KOEHRING

Crane



Easy Control Means Speedy Action! Capacity!

THE operator handles the Koehring Crane with his fingers — not with his weight! He can shift the levers with light pressure! Pedals are as easy! Double outside-band friction clutches make control easy. Operator maintains top capacity every minute of the day. Besides, easy control gives zip and speed to every function.

Booming and hoisting may be combined in one operation instead of two stop-and-go operations. The Koehring is designed for it. No excessive wear!

Koehring heavy duty construction is the soundest value you can buy in a crane. It is the distinctive value in the crane field.

Write for Crane Bulletin C E 32

KOEHRING COMPANY

PAVERS--MIXERS--GASOLINE CRANES, DRAGLINES AND SHOVELS

MILWAUKEE, WISCONSIN

Sales Offices and Service Warehouses in all principal cities

Foreign Department—Room 1370, 50 Church St., New York

Canada—Koehring Company of Canada, Ltd., 105 Front Street, East, Toronto, Ontario.

Mexico—F. S. Lapum, Cinco De Mayo 21, Mexico, D. F

Crane Capacities

No. 1—¾ cu. yd. clam-shell bucket on 40 ft. boom, standard.

Lifting capacity, 10 tons at 12 ft. radius.

4 cylinder, 5 in. by 6 in. gasoline engine, 1000 R. P. M.

No. 2—1 cu. yd. clam-shell bucket on 45 ft. boom, standard.

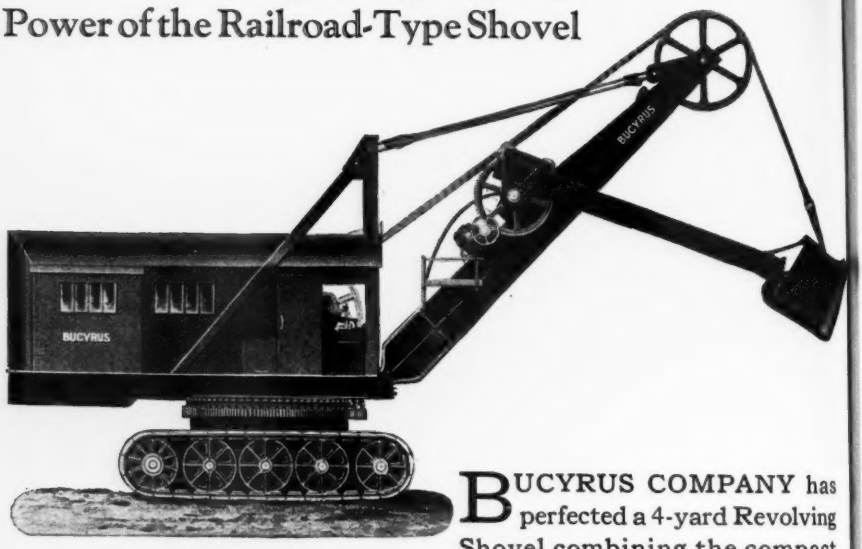
Lifting capacity, 15 tons at 12 ft. radius.

4 cylinder, 5¾ in. x 7 in. gasoline engine, 1000 R. P. M.

A 2324-III-IV

A New 4-yard Heavy-Duty Revolving Shovel

—with the Strength, Rigidity and Power of the Railroad-Type Shovel



BUCYRUS COMPANY has perfected a 4-yard Revolving Shovel combining the compact strength and power of the railroad-type shovel, with the full-circle swing and mobility of the revolving shovel. This new machine is built to handle the toughest digging encountered in mine, quarry and heavy construction work.

Steam or Electric

We will be glad to send you Descriptive Bulletin **D-1201-A**

BUCYRUS

Established in 1880.

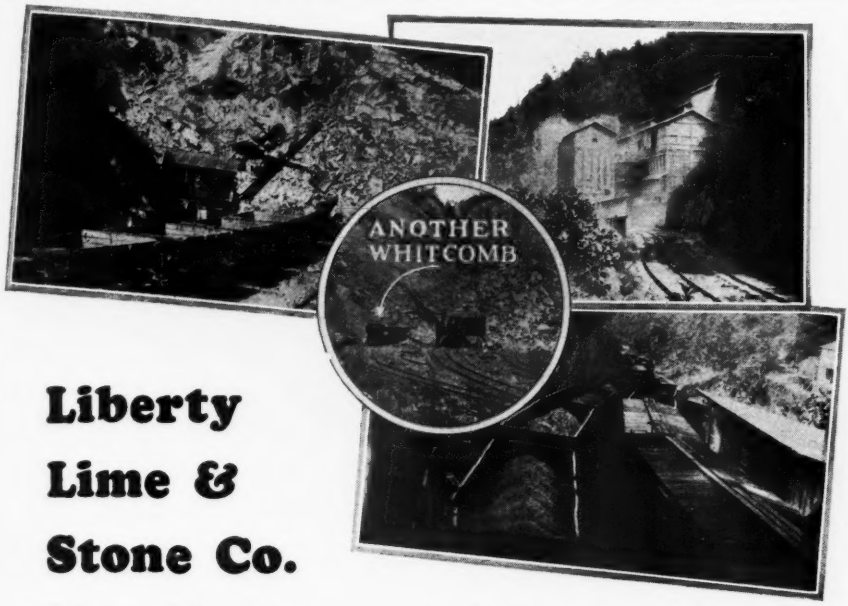
Railroad Type and Revolving Shovels of All Sizes, Dragline Excavators, Trench Excavators, Dipper, Hydraulic and Placer Dredges, Spreader Plows, Wrecking Cranes, Etc.

BUCYRUS COMPANY, South Milwaukee, Wis.

New York Chicago Birmingham San Francisco Portland Denver Tokyo London

A Special Plant at Evansville, Indiana, Devoted Exclusively to Small Revolving Shovels.

682



Liberty Lime & Stone Co.

Use Whitcomb Locomotives

Again "Whitcombs" are selected. The Liberty Lime and Stone Company, Rocky Point, Va., use a 9-ton 42 gauge "Whitcomb" because they want economical, dependable service. That service is assured. The years of experience, the mechanical exactness, and the quality of materials that go into "Whitcombs" are a guarantee of satisfactory service.

Put a "Whitcomb" on your next job. Note the difference in the operating costs, pulling power and flexibility. There is a "Whitcomb" to do your job. Let us help you to select the proper type. Catalogs on request.

GEO. D. WHITCOMB COMPANY
ROCHELLE, ILLINOIS
Offices in principal cities

GASOLINE-STORAGE BATTERY-ELECTRIC
WHITCOMB
LOCOMOTIVES

A Mouthful at Every Bite

The whale's mighty jaws, backed by the tremendous strength in his huge body, close over a heaping mouthful at every bite. Rarely, indeed, does the mammal king only "skim the surface" in his ponderous rush. He goes after his mouthful with the same determination that has marked the survival of the whale through eons of time during which weaker water giants faded into oblivion.

The whale and an Owen Bucket—jaws of irresistible force, terrific body strength—that mouthful at every bite. But unlike the water creature, an Owen Bucket is quick in action and possesses the outstanding capacity for "digging in." An Owen Bucket insures larger loads, greater profits and most economy in operation.

We want you to know more about Owen Buckets—their strong and sturdy construction, their adaptability, their earning power—and how, by their nine points in superior construction, they mean a "whale" of a saving in your digging dollars. Send for Folder "2-A." It tells the story.

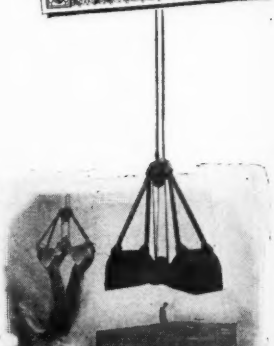
Guarantee

Owen Buckets, properly installed and operated, are guaranteed to do a bigger day's work than any other bucket of the same weight and capacity—

—or—

Write your own guarantee!

THE OWEN BUCKET CO.



A Type "J" Owen Re-handling Bucket of one yard capacity unloading 2" crushed slag for Ohio Coal and Supply Co., Cleveland.

The OWEN BUCKET Co.

806 Rockefeller Building Cleveland, Ohio

Baltimore Chicago Dallas Los Angeles Minneapolis Philadelphia
Pittsburgh New York Miami Portland St. Louis San Francisco

OWEN CLAMSHELL BUCKETS INSURE A BIGGER DAY'S WORK

Owen Buckets

INSURE A BIGGER DAY'S WORK

© OBCO

Du Pont chemical engineers insure uniformity of quality by chemical control through every step of manufacture from raw material to finished product.

"How soon can you deliver?"

ASSURANCES of time of shipments and deliveries are based on actual knowledge of manufacturing and shipping conditions at our plants.

Prompt shipments of explosives are made because of the ample stocks available at plants and in storage magazines located in regions where industries require our products.

This nation-wide ability to serve industry promptly with explosives of the highest quality is only *one* of the reasons why du Pont enjoys leadership in the explosives field.

In quarrying operations use du Pont Explosives

There is a du Pont explosive to meet every blasting need—to do *your* particular work *best* at *least* expense.

Du Pont blasting accessories give you maximum efficiency from your explosives. Make every shot *sure*—protect your blasting investment by using only du Pont accessories.

For further information about du Pont explosives and blasting accessories, please refer to Mining Catalog—Metal-Quarry Edition and Pit and Quarry Handbook—or write to nearest office.

E. I. DU PONT DE NEMOURS & CO., Inc.
Explosives Department **Wilmington, Del.**

DU PONT

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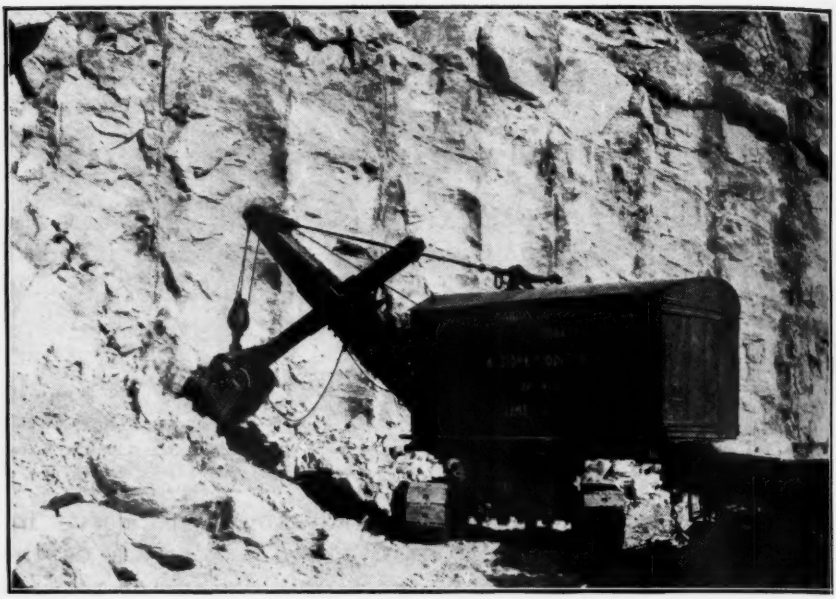
Du Pont Products Exhibit
Atlantic City, N. J.

POWDER MAKERS SINCE 1802



Marion Model 37, 1¾-yard Electric, operated at Lime Crest, N. J., by the Limestone Products Corporation of America

Favorite in the Quarry

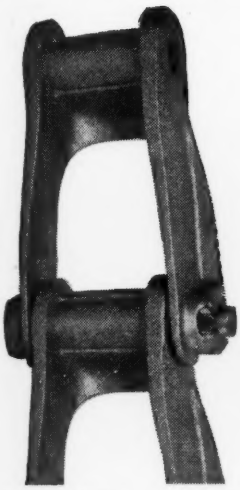
The Model 37 Electric, with its three-motor control, ease of operation and freedom from extra labor expense, insures a steady flow of production at a decided reduction in costs.

This 1¾-yard Marion is the best known and most widely used revolving shovel in quarry use.

Electric power is now available nearly everywhere, and high tension lines that will eventually network the whole country are under construction. The cost of this electric power is remarkably low with the result that in nearly every case the cost of operating an electric excavator is much less than a similar size steam shovel.

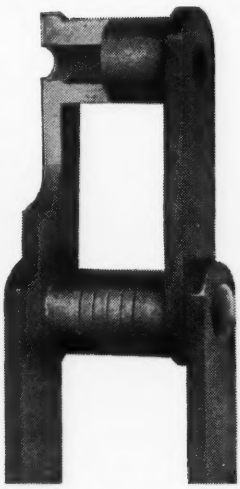
MARION

The Marion Steam Shovel Co., Marion, Ohio, U. S. A.



Peerless Chain — for heavy service in the Cement Industry and for chain drives where much wear from long service is expected. A hard steel bushing internally receives wear from movement of pin and externally takes wear incident to contact with sprocket.

No. SS40 Steel Thimble Roller Chain—for severe driving service. Operates over No. 103 Standard Sprockets. Easily assembled. Hardened steel wearing parts and high carbon steel side bars. All wear on moving parts is confined to renewable steel pins and bushings. Square shank pin construction.



Hercules No. 111 Combination Malleable Iron and Steel Chain. An inexpensive general service chain for drives, elevators and many types of conveyors. Square shank pin construction—holds pin rigidly in the side bars.

Balanced Construction

IN OVER two score years of chain building experience and application, Jeffrey Engineers and Metallurgists have been constantly striving to improve the design and quality of Jeffrey Chains for all Elevating, Conveying and Power Transmission Purposes, as well as attachments for all classes of service.

The wearing life has been considered as well as initial strength. All parts are properly proportioned to carry the load for which they are designed. The metal is placed exactly where it is needed.

Built of highest grade stock; assembled by high class workmen; carefully inspected and tested for tensile strength, pitch, etc.

Jeffrey Sprockets of various kinds are made to "fit and last."

Standard sizes of Jeffrey Chains, Attachments, Sprockets, etc., carried in stock for prompt delivery.

The Jeffrey Mfg. Co., 917-99 North Fourth Street Columbus, Ohio

JEFFREY

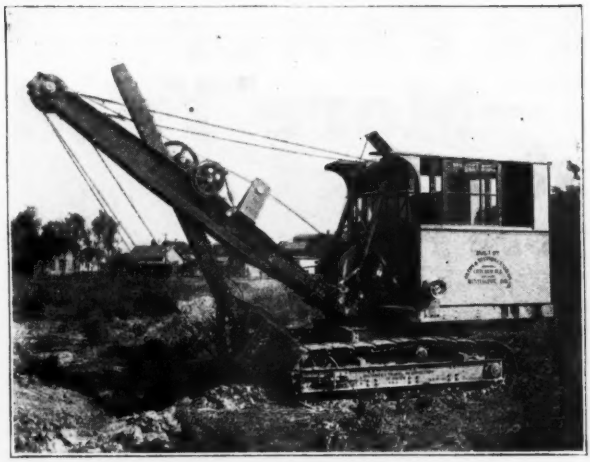
MATERIAL HANDLING EQUIPMENT

The "AMERICAN" Gasoline Shovel on Continuous Chain Treads

Difficult terrain and the absence of good boiler water don't mean a thing to the "AMERICAN" Gasoline Shovel on crawler treads. One of these machines used for heavy digging in rough, heavily wooded country near Susanville, California, walked up a 15% grade without a bit of hesitation and traveled through thick underbrush which would have blocked an ordinary shovel completely.

Perhaps this rugged adaptable machine would fit into your operation and turn into the profit column money now spent as operating expense. Why not investigate? It won't obligate you.

AMERICAN
HOIST & DERRICK CO.
Saint Paul, Minn.
New York, Chicago, Pittsburgh, Seattle, New Orleans



This is the O-S Type "V" 1/2 Yard Gas Shovel. An ideal machine for use in the small sand or gravel pit—fast and economical

300 to 400 yards of material a day

The O-S Type "V" Gas Shovel is just the machine for the small sand and gravel pit where the daily output does not warrant the purchase of a large steam shovel.

This machine is powered by a 50 H. P. Hercules Gasoline Motor which is economical on gas and oil. Traveling, steering, hoisting, crowding and dumping are executed by one man from the cab.

The Type "V" is equipped with a boom that measures 16′-0″ from pin to tip. The dipper stick is 12′-6″ long—not including the ½ yard scoop. It has a maximum reach of 20′ from boom pin to dipper scoop; a maximum dumping height of 10′ from the ground.

The "V" is mounted on the Famous ORTON Flexible Treads. It is easily and quickly converted into a 5-ton Clamshell Crane, Ditcher or Skimmer Scoop or Dragline in the field.

Write for specifications and prices

ORTON & STEINBRENNER CO.

Locomotive Cranes, Flexible Tread Cranes, Gantry Cranes, Truck Cranes.

608 So. Dearborn Street
CHICAGO, ILL.

Clamshell Buckets, Orange Peel Buckets, Rock Crushers, Power Shovels.

More Power —More Yardage

and No. 2 has More Power

When you hire a husky to handle a pick and shovel you look at the size of his muscles. When buying a steam shovel, look at the size of the power plant.

The No. 2 has the largest hoisting engine and boiler of any ⅞-yard shovel built. That's why owners are getting more yardage—and more profits.

Bulletin 68 tells all about this shovel. Have you your copy?

Gas Shovels • Locomotive Cranes • Clam-shell Buckets • Pile Drivers

C-2-93

NEW YORK BUFFALO PHILADELPHIA PITTSBURGH **CLEVELAND** DETROIT CHICAGO SAN FRANCISCO

Biggest Production Secured With Lowest Maintenance

The Modern Massillon Steam Shovel is above everything else a producer. It aggregates the biggest production with the lowest maintenance costs, under any conditions that may obtain.

The reasons for the Massillon's big production:

Powerful Digging
Speed and Mobility
Interchangeable Parts
Accessibility
Low Maintenance
Engineering Economy
Endurance and Dependability

The Modern Massillon can be used with clamshell or dragline equipment or as a locomotive crane. Send for our descriptive book.

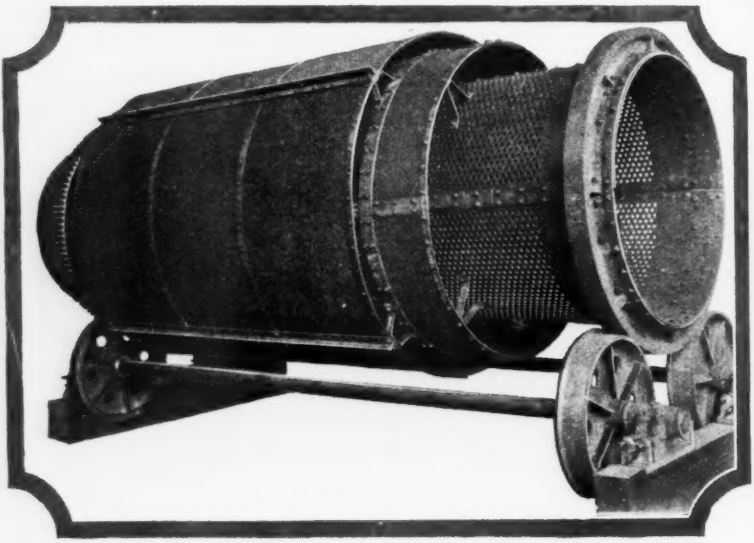
THE RUSSELL & CO.

MASSILLON, O.

(Established 1842)

The **MODERN MASSILLON**

Steam — 3/4–7/8 RANGE — Shovel



Webster Revolving Screens

FOR EFFICIENT screening in Sand, Gravel and Stone Crushing Plants, Webster Revolving Screens are reliable and dependable in operation. They are accurately designed and ruggedly built for years of hard service—that means lasting satisfaction.

Built in various types and sizes with capacities to suit the individual installation.

Let our engineers help you in the selection of proper screens for your plant. They are at your service.

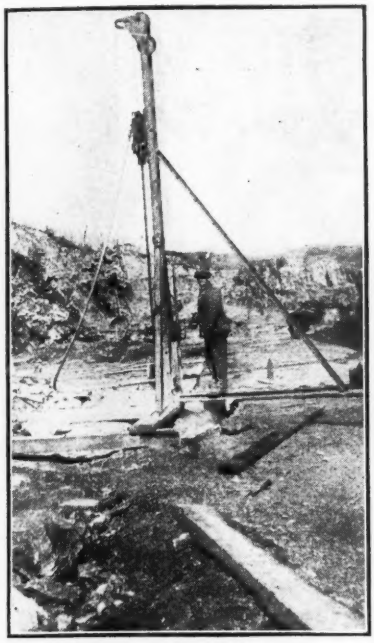
Webster equipment for sand, gravel, cement and stone crushing plants includes belt conveyors, bucket elevators, screens, screw conveyors, chain, sprockets, buckets, etc.

Catalog sent on request.

THE WEBSTER MFG. COMPANY

4500-4560 Cortland Street

CHICAGO



Model 34 Waugh Turbro on Derrick

Hammer Drills

and

Derrick Rig

In non-abrasive rock, where the face is not too high, the use of WAUGH HAMMER DRILLS will secure economies in drilling costs, greater production, and better fragmentation.

In limestone and other free cutting formations, 200 feet of hole per day may be conservatively expected. The use of a portable derrick rig simplifies the drilling of vertical holes 20' to 40' deep, and facilitates set-ups and steel changes.

Full information at the nearest branch office.

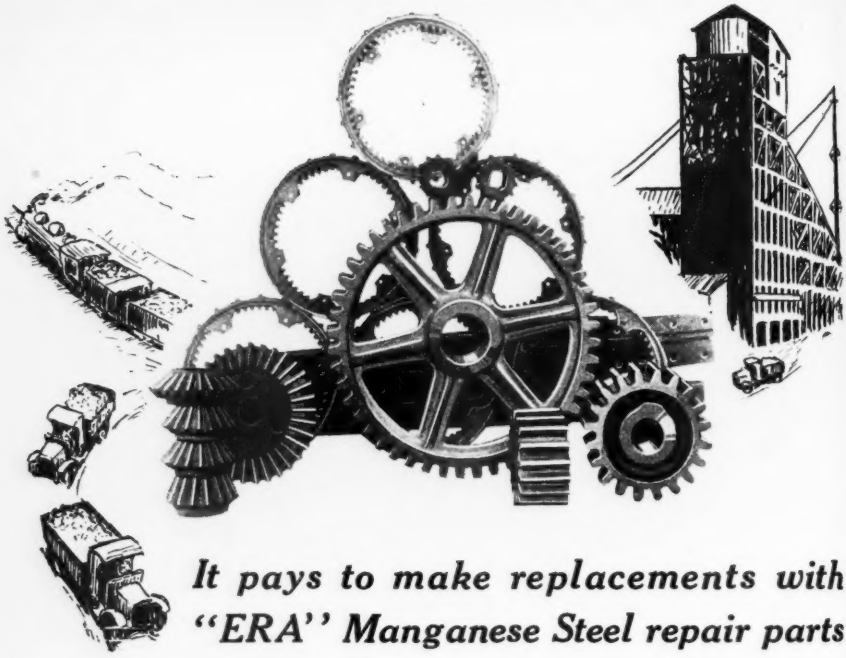
THE DENVER ROCK DRILL MANUFACTURING COMPANY

DENVER COLORADO

New York, Pittsburgh, Scranton, Pottsville, Mexico City — Chicago, Duluth, Houghton, Knoxville, Santiago — St. Louis, El Paso, Birmingham, Joplin, Lima — San Francisco, Seattle, Salt Lake, Butte, Wallace, Los Angeles

ROCK WAUGH DRILLS

Canadian Rock Drill Company, Limited, Sole Agents in Canada
Montreal, Quebec · Cobalt, Ont. · Nelson, B. C. · Vancouver, B. C.
The Denver Rock Drill & Machinery Company, Limited
Sole Agents in South Africa and Rhodesia
Southern Life Building, Johannesburgh, Transvaal, S. Africa
Andrews & George Company, Sole Agents in Japan, Tokio, Japan
Allied Engineering, Limited, Melbourne, Australia



It pays to make replacements with "ERA" Manganese Steel repair parts

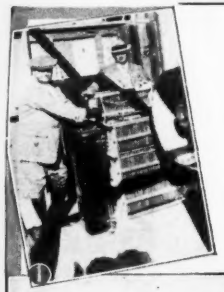
A LARGE percentage of all "ERA" Manganese Steel Parts sold are used to replace equipment parts made of other material. Because of the greater wearing qualities of "ERA" Manganese Steel it stands up under wear as no other metal can.

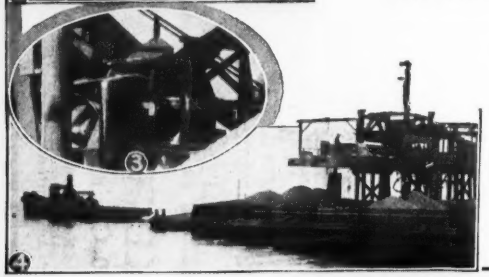
Midseason breakdowns and excessive repair bills can be eliminated for "ERA" Repair parts because of their greater wearing quality often run season after season.

If your repair bills are too heavy, get the facts of "ERA" Manganese Steel. Make a comparison in cost performance and durability, see how the longer service will put money in your pocket.

MANGANESE STEEL
ERA
THE FIRST - STILL LEADS IN QUALITY

HADFIELD-PENFIELD STEEL CO.
Bucyrus, Ohio





See Telsmith at Avalon on the Sea——

Plate one shows Mr. William Wrigley starting the crushing plant of the Catalina Company, located on Catalina Island near Los Angeles. Look it over on your next trip to Southern California. Built on a steep mountain-side, facing the Pacific Ocean, this is not only one of the most modern plants in the United States, but is likewise the most picturesque. The initial breaker is a 48-60-in. jaw crusher, which breaks up the large rock to 8″-10″ size. The hill-side has been excavated to provide storage under the jaw crusher; and conveyors have been installed in a tunnel to take the rock to a No. 16-A Telsmith Primary Breaker, set to 2½ in. discharge. This machine has demonstrated its ability to handle 110 tons per hour, with an average power consumption of 50 HP. The minus 2-in. rock is then scalped out and the rest is re-crushed by two No. 4 Telsmith Reduction Crushers set to make minus 1½-in. size.

It is questionable just how long a cast iron crusher would survive in this plant. The rock is a very hard basalt. The machines are all worked to full capacity, with no mercy shown. Frequently, bits of tramp iron slip through into the feed. This is no place for a weakling crusher. But Telsmith is built to endure severe usage. With steel frame, steel crown, unbreakable bolt-shaft, short structure, huge bearings, automatic lubrication, it was only to be expected that Telsmith would succeed, even at the Catalina quarry—and Telsmith has made good *as usual.* Glad to send you, without obligation, Catalog No. 161 (Telsmith Primary Breaker) and Bulletin No. 2F15 (Telsmith Reduction Crusher).

SMITH ENGINEERING WORKS

3183 Locust Street **MILWAUKEE, WIS.**

Canadian Representatives: Canadian Ingersoll-Rand Co., Montreal, P. Q.

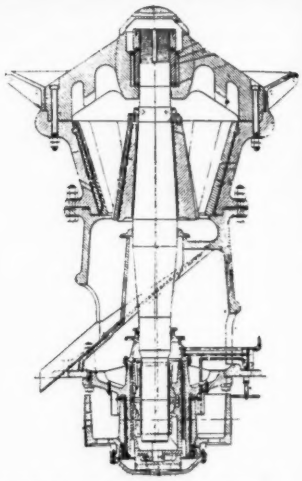
Old Colony Bldg., Chicago, Ill.
18 E. 41st St., New York City.
Waldo Bros. & Bond Co., Boston, Mass.
Beckwith Mchy. Co., Cleveland—Pittsburgh
Seibert-Milburn Co. Columbus, O.
Brandeis Mchy. & S. Co. Louisville, Ky.
Borchert-Ingersoll, Inc., St. Paul, Minn.
Bunting Hdw. Co., Kansas City, Mo.
Stuart S. Smith Co., San Francisco, Calif.
Garlinghouse Bros., Los Angeles, Calif.

THE CRUSHERS

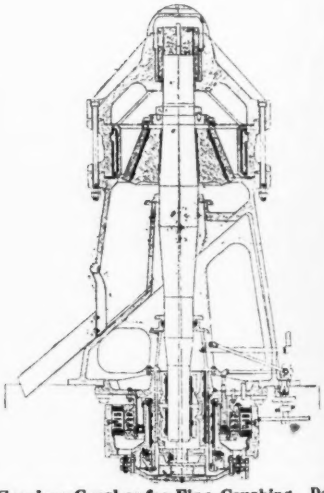
with the Troubles Left Out

WHY THEY LEAD

1—They are noiseless and run like watches.
2—50% greater capacity for same power.
3—Practically no wear on anything but head and concaves.
4—Short shaft and saving in head room with packed dust collars.
5—Shaft reinforced with self-locking head so that it cannot break where 90% of shafts have broken.
6—Can be driven right, left, or standard, as sent from shop.
7—Eccentric is turned by flexible coupling attached to pulley, which prevents side thrust and heating, as in geared crushers.
8—Ball and socket eccentric, self-aligning, eliminating friction and heating. Runs for years without attention.
9—Positive circulating oil system through filter and cut geared oil pump.
10—Made in our own shop by experts, trained for the job.
11—It is a crusher with the trouble left out. See it in operation, and you are unfit to listen to any geared crusher salesman. In fact, if you are near one of his machines, you can't hear him, if you are so inclined.
12—Our fine crusher does the work of 4 geared crushers.



Standard Ball Bearing Gearless Crusher Sizes No. 1 to No. 60—Weights 1,000 to 900,000 lbs.



Gearless Crusher for Fine Crushing. Do not be deceived by Vertical Concaves; that is not what makes a fine crusher.

Send for catalogue and tell us what your problems are, and one of our experts will call on you without obligation on your part.

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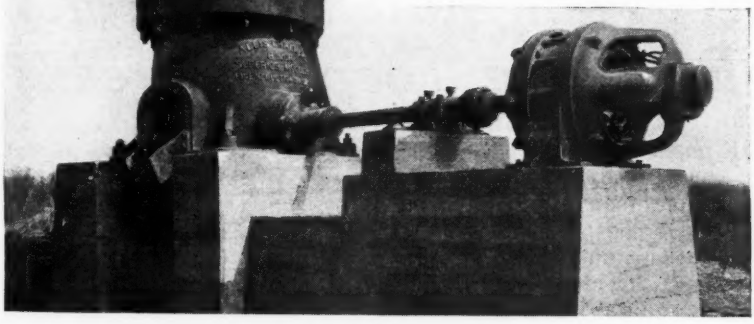
The most successful secondary gyratory crusher on the market today

Allis-Chalmers 6" Superior McCully Fine Reduction Gyratory Crusher direct connected to an Allis-Chalmers 50 H.P. type any slip ring motor @ 600 R. P. M. installed in the plant of the Hallock Sand Co. Columbus, Ohio.

Owing to the high speed at which these crushers operate the direct connected drive makes an ideal installation.

Send for Bulletin No. 1461.



Sizes, Capacities, Horse Power and Weights:

Size of Crusher in Inches	Two Feed Openings Size Each in Inches	CAPACITY PER HOUR IN TONS OF 2000 POUNDS — Size of Discharge Opening in Inches									DRIVING PULLEY		H. P. Required	Weight of Crusher in Lbs..
		¾	⅞	1	1¼	1½	1¾	2	2¼	2½	Size in Inches	R. P. M.		
6	6x40	24	28	32	40	48	....	....	....	....	36x12½	500	40 50	32000
10	10x52	....	....	....	....	80	94	107	120	135	36x18½	450	75 100	64000

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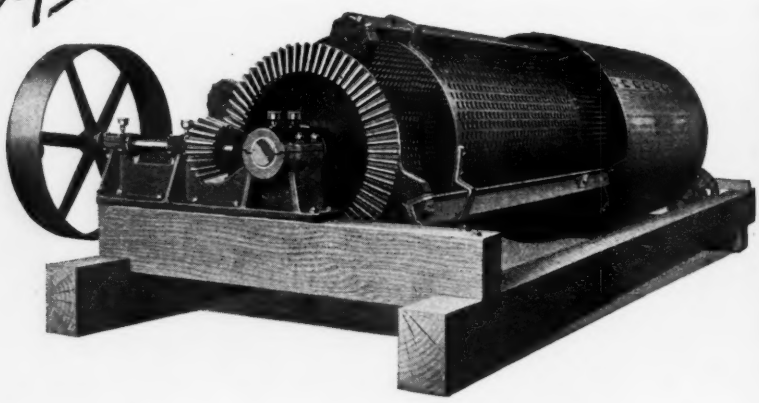

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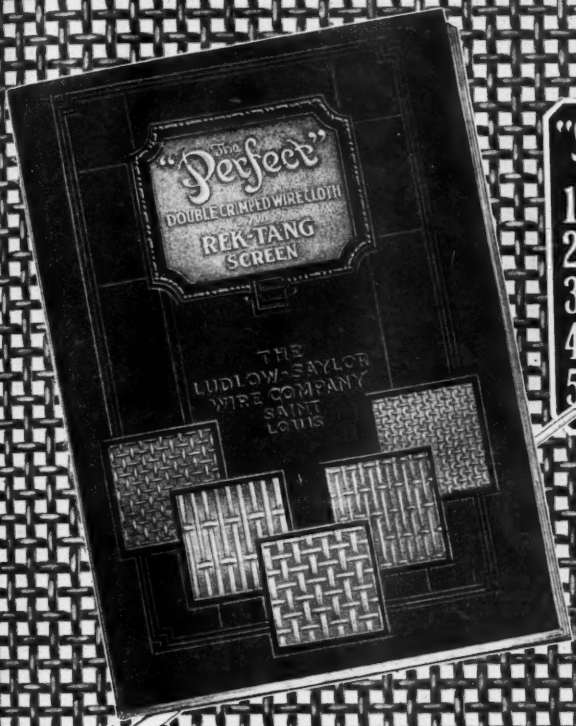

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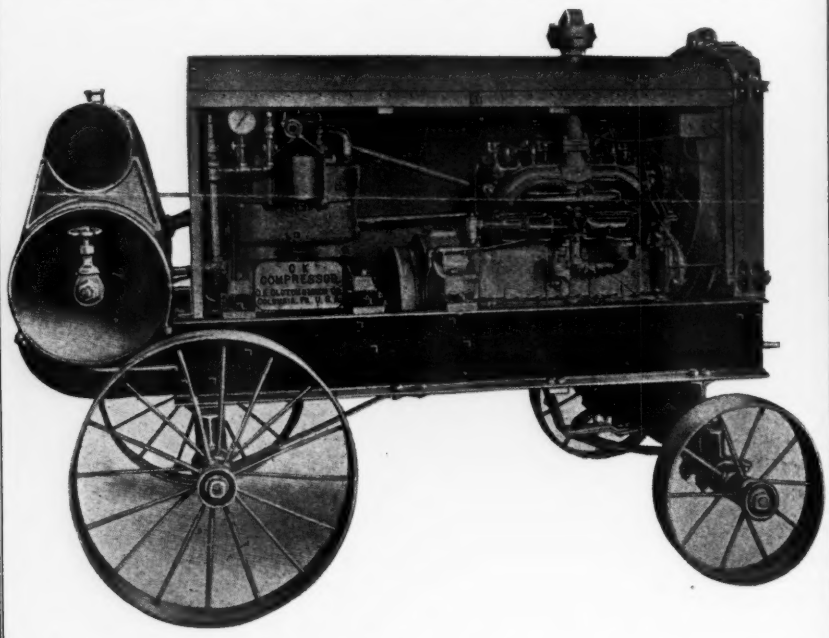
DEPENDABLE AIR COMPRESSORS AND HOISTS



O. K. Portable Air Compressor

O. K. COMPRESSORS, like their family products, O. K. Hoists, are built to meet the heavy exacting requirements in pit or quarry. Tried, tested and proved to be correctly adapted to any air equipment, O. K. Portable Air Compressors are offered with an assurance that they will prove efficient and economical under any conditions.

O. K. Portable Compressors are made with channel steel frame—strong but light—large heavy cylinders, efficient cooling system, "Duo Plate" air valves, and large bearings with positive lubrication.

O. K. Compressors have larger capacity than other types, special carburetor control saving gas by idling motor when not supplying air. They are made in three sizes with capacities 118 cu. ft., 160 cu. ft., and 260 cu. ft. per minute. Powered with either gasoline or electric motor.

Write for Compressor Bulletin

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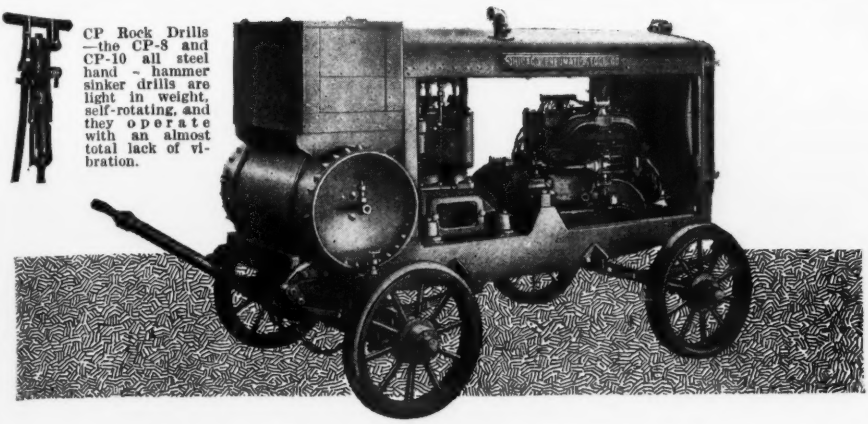
CP Rock Drills —the CP-8 and CP-10 all steel hand - hammer sinker drills are light in weight, self-rotating, and they operate with an almost total lack of vibration.



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means well equipped

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Chicago Pneumatic portable compressors are made in capacities ranging from 100 to 300 cu. ft. free air displacement per minute. They are built in gasoline or electric motor driven types mounted upon steel or rubber-tired wheels, CP trailers, motor trucks or skids.

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For complete information on CP Compressors, rock drills, hammer drills, pavement breakers or any pneumatic tool—write for Bulletins. And—CP Bulletins are convenient and handy references.

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BOYER PNEUMATIC HAMMERS··LITTLE GIANT PNEUMATIC AND ELECTRIC TOOLS
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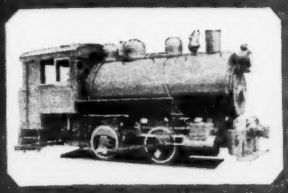
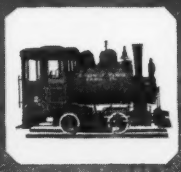
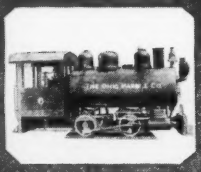
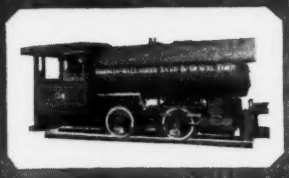
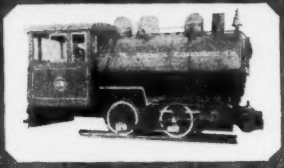


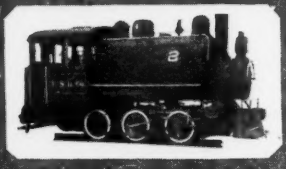


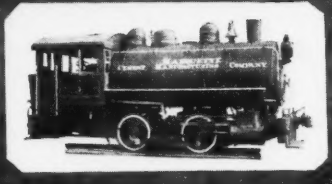




A Good Locomotive is the Best Production Assurance — you can have —







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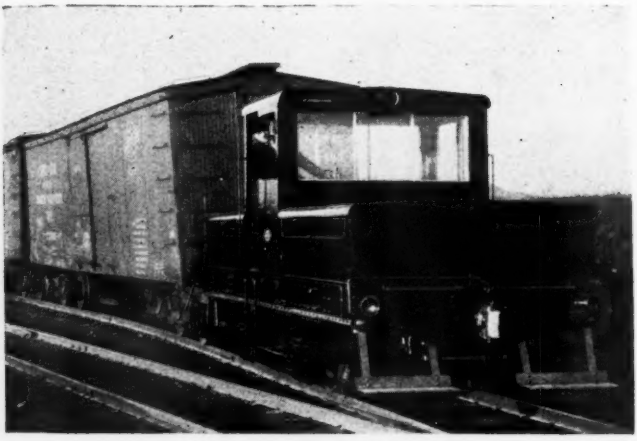

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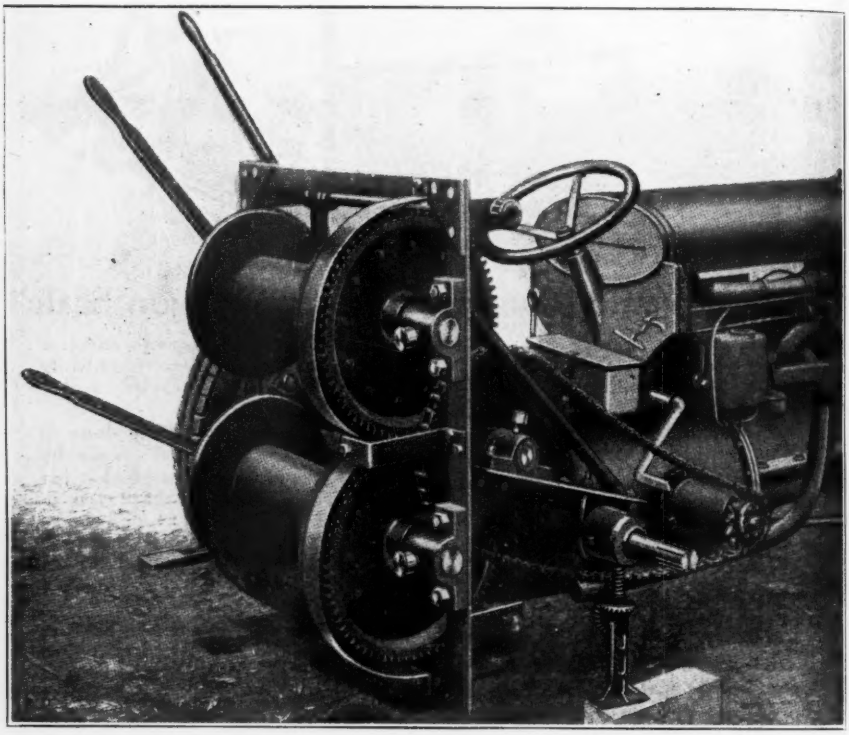

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FOR the sand and gravel operator who requires powerful, uniform hoisting energy every day in the week, Continental Winches make ideal hoisting units. They are excellent for either portable or stationary work. They are made in two types—friction drive and gear drive—and come in two sizes, single and double drum.

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(See other side)

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- ☐ Screens, Vibrating
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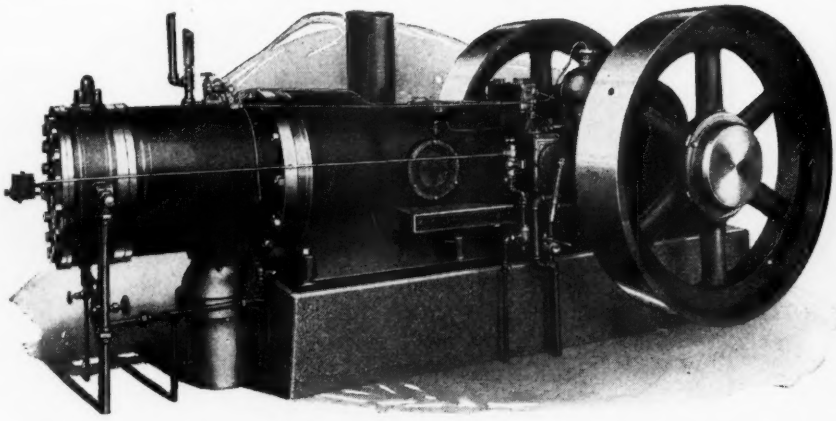

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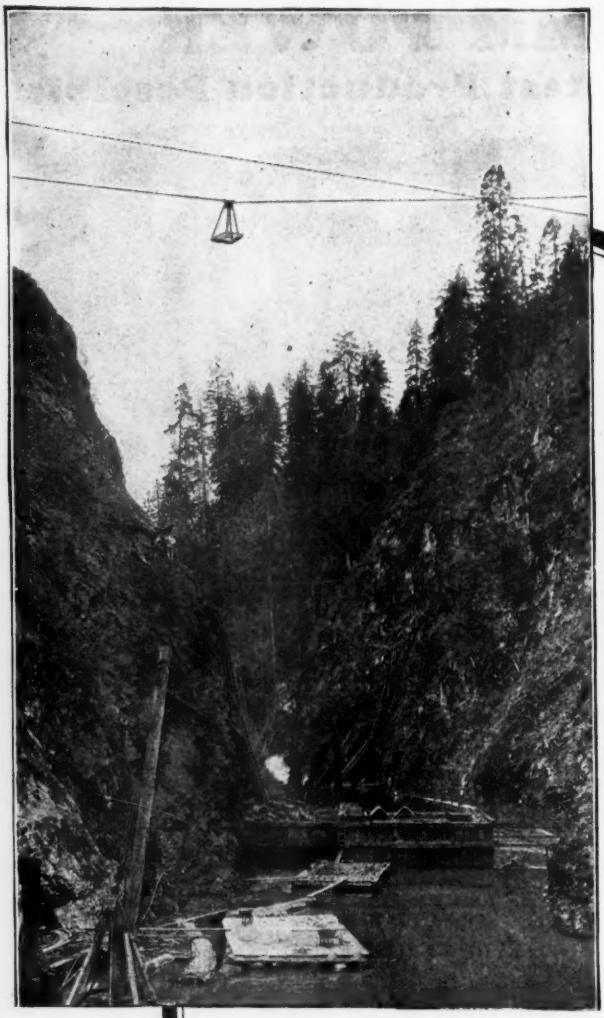

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Engineers of any great importance are insisting more and more on "Williamsport" and the protection it affords the user.

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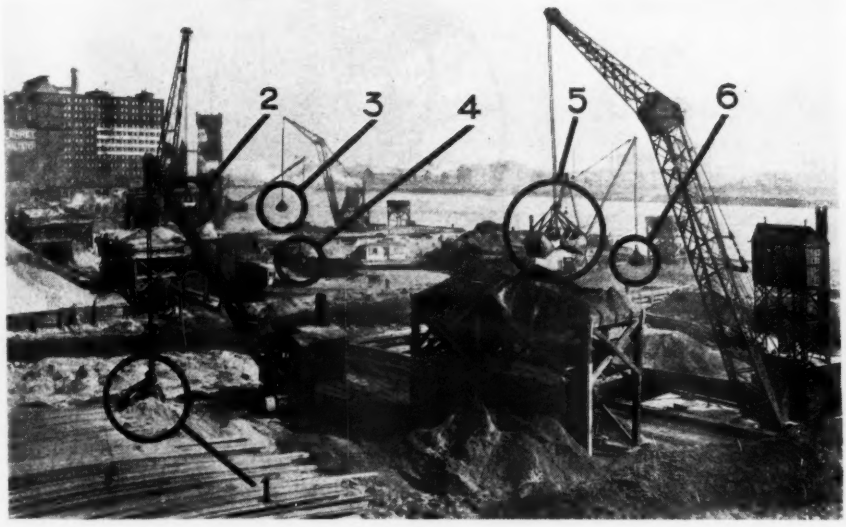

6 visible indorsements of Hayward Bucket efficiency

In New York City, where ground values run high, materials movement must be speeded to assure a profit.

This illustration shows 6 Hayward Clam Shell Buckets used to make certain a profitable return on the larger investment in hoisting units.

It is a significant fact that similar groups of Hayward Buckets are commonly found wherever large quantities of bulk materials must be handled speedily.

Hayward Engineers are always glad to place their knowledge and experience at your disposal—to help reduce high costs, to overcome some difficult digging or rehandling situation, or to aid with suggestions concerning a contemplated layout which includes digging, rehandling, or reclaiming bulk materials of any nature. This service is yours without cost or obligation.

THE HAYWARD COMPANY
54-56 Church Street, New York, N. Y.

Builders of Clam Shell, Orange Peel, Drag Line, and Electric Motor Buckets; Dredging, Excavating, and Coal Handling Machinery.

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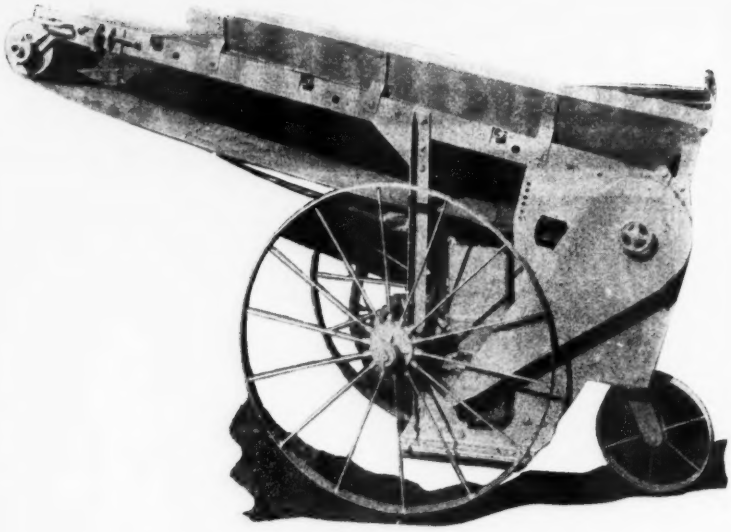

New Methods Supersede the Old

Some unprogressive materials people still handle their materials with hand labor, loading and unloading cars, trucks and bins with shovels! But Time and Industrial Progress demand more efficient methods. Loading and unloading methods must keep pace with other industrial developments.

More and more the hand shovel is giving way to mechanical loader, and Uniform 24 hour per day results are taking the place of Flanagan, McDougal, Kennesey and Murphy with their clay pipes and intermittent tete-tetes,—and their "good enough" results.

Ottumwa Box Car Loaders eliminate loading gangs, reduce costs, prevent delays and increase capacity. The Ottumwa is manufactured with electric or gasoline power. It has roller and ball bearings throughout, and latest improved Alemite greasing system. Write for full information and prices.

OTTUMWA BOX CAR LOADER CO.

OTTUMWA, IOWA

AMSCO

THE OHIO & WESTERN PENNSYLVANIA DOCK CO.
CONTRACTOR

CLEVELAND, OHIO

February 26, 1925.

American Manganese Steel Co.,
Chicago Heights, Ill.

Gentlemen:-

In reply to your letter of February 10, we are quoting below an extract from a letter from our Dock Superintendent, Mr. C. E. Cole:

"The sheaves I referred to were 40" in diameter, located in the towers of the Hoover & Mason unloaders and were placed at an angle which caused a terrific wear on the flange on one side and made it necessary to reverse them about once a month and renew every two months.
To overcome this practically continuing expense, manganese sheaves were installed and saw five years of service and were still in good condition when the plant was dismantled in 1918."

Hoping this is the information that you wish, we remain,

Very truly yours,

THE OHIO & WESTERN PENNSYLVANIA DOCK CO.,
R. V. Clay,
Purchasing Agent

RVC:G

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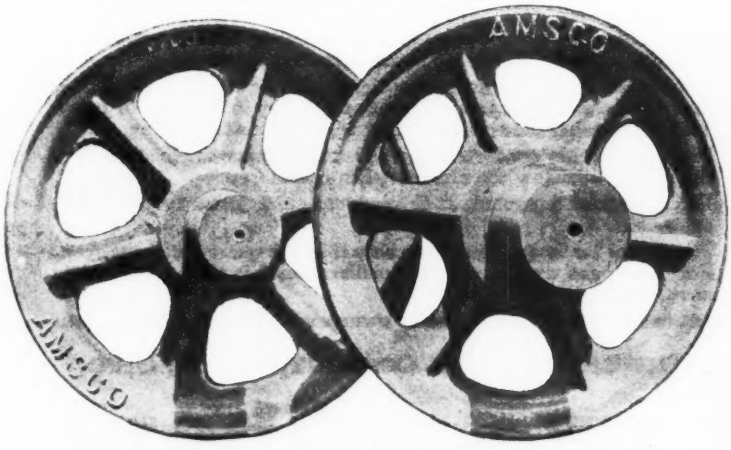

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General Offices: 388 E. Fourteenth St., Chicago Heights, Ill.

Foundries: Chicago Heights, Ill.; New Castle, Del.; Oakland, Cal.; Los Angeles, Cal.; Denver, Colo. Southern Manganese Steel Co., St. Louis, Mo.

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A Giant For Work

A shovel's value in quarry work can't be measured by size alone. Take the Eagle Point Lime Works at Dubuque, Iowa, as an example.

They have a ¾ yard Type O Thew Gasoline Shovel and for all around usefulness they say, "It can't be beat."

It loads fast. It easily places the big chunks for breaking up. When ready for a blast it can amble out of the way in a hurry, or move easily to another part of the quarry where it can keep busy.

It can be quickly converted into a clamshell crane for loading from the stock pile below the crusher when necessary.

Being gasoline operated, it is ready to start instantly anywhere, anytime.

The day of the huge, ponderous shovel in the quarry is about over. For all around usefulness, the smaller shovel is the better investment, especially if it is a Thew.

Let us refer you to other quarry owners who will tell you the same.

THE THEW SHOVEL COMPANY, LORAIN, OHIO

Thew Lorain Shovels

Dig Faster—Last Longer

Pit and Quarry

Index to Advertisers

VOL. 10 CHICAGO, ILL., AUGUST 1, 1925 NO. 9

Acme Road Machinery Co. 118
Allis-Chalmers Mfg. Co. 21
American Hoist & Derrick Co. 12
American Manganese Steel Co. 37
American Spiral Pipe Works 123
American-Terry Derrick Co. 116
Atlas Car & Mfg. Co. 127
Austin Mfg. Co. 119

Bacon, Inc., Earl C. 119
Barber-Greene Co. 12
Bay City Dredge Works 119
Beck and Babb 108
Blaw-Knox Co. 122
Briggs and Turivas, Inc. 111-114
Bucyrus Co. 6
Burch Plow Works Co. 120
Burnham R. E. 115
Burrell Engr. & Const. Co. 121
Butterworth & Lowe 118

Caldwell & Son., H. W. 134
Chicago Perforating Co. 115
Chicago Pneumatic Tool Co. 25
Clapp, Riley and Hall Equip. Co. 106
Cleveland Rock Drill Co. 4
Cleveland Wire Cloth & Mfg. Co. 128
Climax Engineering Co. 103
Continental Motors Corp. ..... Back Cover
Conveying Weigher Co. 130
Cummer Lumber Co. 110

Dake Engine Co. 122
Denver Rock-Drill Co. 17
Domestic Engine and Pump Co. 123
Du Pont de Nemours & Co., Inc., E. I. 9

Earth and Rock Equipment Co. 108
Easton Car and Const. Co 127
Economy Pumping Machinery Co. 115
Edelblute Co., T. H. 126
Ensign-Bickford Co. 124
Equipment Corporation of Am. 107
Erie Pump & Engine Works 118
Erie Steam Shovel Co. 3

Fairbanks-Morse & Co. 29
Fate-Root-Heath Co. 68-69
Foote Bros., Gear and Machine Co 125
Foster Co., L. B. 26

Georgia Iron Works 131
Goodman Mfg. Co. 28
Greenspon's Sons Iron and Steel Co., Jos. 110
Gregory Electric Co. 110
Gruendler Patent Crusher and Pulverizer Co. 125

Hadfield Penfield Steel Co. 18
Haiss Mfg. Co., Geo. 67
Hayward Co. 35
Heineken, W. P. 111
Helmick Foundry-Machine Co. 116
Hendrick Mfg. Co. 129
Hubbard Steel Foundry Co. 70
Hyman-Michaels Co. 108

Industrial Equipment 131
Industrial Works 2

Jeffrey Mfg. Co. 11

Kansas City Hay Press Co. 117
Kennedy Van Saun Mfg. & Engr. Corp. 20
Kingsford Fdry., and Mach. Wks. 115
Koehring Co. 5

Lansing Motor and Pump Co. 124
Lidgerwood Mfg. Co. 132
Link-Belt Co. 135
Ludlow-Saylor Wire Co. 23

McGann Mfg. Co. 118
McLanahan Stone Machine Co. 121
McMyler Interstate Co. 14
McNeal Machinery Co. 111
Mallory Machinery Corp. 114
Marion Steam Shovel Co. 10
Martin Machinery Co., E. A. 110
Miami Trailer Scraper Co. 132
Milwaukee Locomotive Mfg. Co. 117
Mundy Hoisting Engine Co. 116
Myers Co., L. E. 108

Nelson Iron Works 122
New Holland Machine Co. 120

O. K. Clutch and Machinery Co. 24
Orr and Sembower 133
Orton and Steinbrenner 13
Ottumwa Box Car Loader Co. 36
Owen Bucket Co. 8

Pennsylvania Drilling Co. 116
Pioneer Bucket Co. 133
Plamondon Mfg. Co., A. 134
Porter Co., H. K. 27
Power Mfg. Co. 33
Punxsutawney Drilling & Concr. Co. 115

Randolph-Perkins Co. 116
Russell and Co. 15

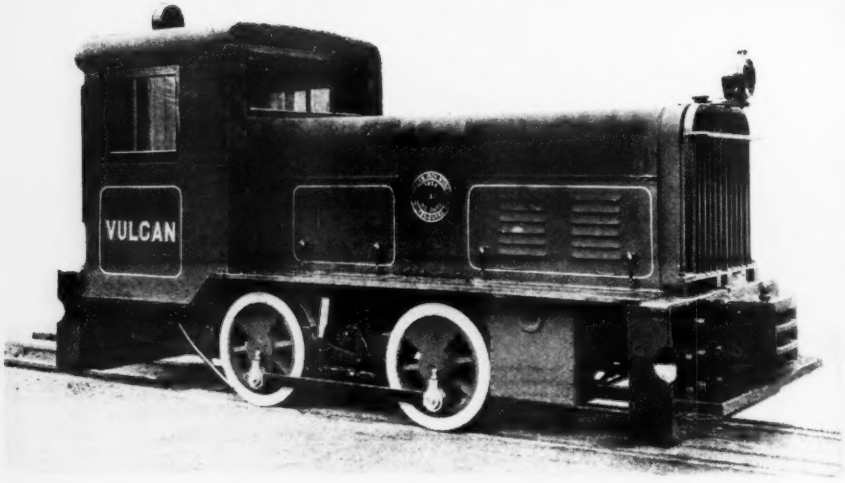
Sanderson-Cyclone Drill Co. 126
Smith Engineering Works 19
Sonken—Galamba Corp. 111
Southern Iron and Equipment Co. 108
Spinks Supply Co. 30
Sunbury Mfg. Co. 128
Sweets Steel Co. 119
Swaby Mfg. Co. 116
Symons Bros. Co. 116

Tampa Shipbuilding and Engr. Co. 131
Thew Shovel Co. 38
Thomas Elevator Co. 117
Tiffin Engine Works 119
Toepfer & Sons 22
Traylor Engineering and Mfg. Co. 130

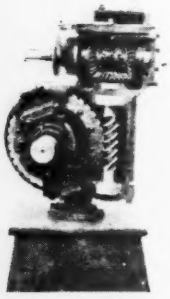
Universal Road Machinery Co. 120
Universal Vibrating Screen Co. 129
Used Equipment Bargains 106-114

Vulcan Iron Works 40

Western Wheeled Scraper Co. 105
Webster Mfg. Co. 16
Whitcomb Co., Geo. D. 7
Williamsport Wire Rope Co. 31



Refinement of Detail



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This worm gear drive among other things is a feature of Vulcan Gasoline Locomotives. No chains or sprockets to wear out. In four years not a single replacement or repair has been made on one of these drives.

THE Vulcan Gasoline Locomotive is a true locomotive with a gasoline power plant — not an automobile engine adapted to tracks. Every detail of construction is designed to give maximum results with minimum upkeep.

Bulletin P.Q. will be sent on request.

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Established 1849

1730 Main St. **Wilkes-Barre, Pa.**

New York
50 Church St.

Chicago
McCormick Bldg.

VULCAN *of* **WILKES-BARRE**

GASOLINE LOCOMOTIVE

Pit and Quarry

A Semi-Monthly Publication for Producers and Manufacturers of Sand, Gravel, Stone, Cement, Gypsum, Lime and Other Non-Metallic Minerals.

VOL. 10 CHICAGO, ILL., AUGUST 1, 1925 No. 9

FEATURE CONTENTS

Two Different Methods Utilized To Produce From Same Deposit 45

An illustrated description of the methods utilized by the State Gravel Company and the Pioneer Sand and Gravel Company.

Analyzing Freight Rate Problems In The Non-Metallic Industries 53

Mr. Whitney an expert on freight problems starts a series of articles dealing with actual cases of inconsistencies in freight rates.

Analyzing a Trap Rock Operation 55

F. A. Westbrook discusses the operation of the Connecticut Quarries Company at Cavaan, Connecticut.

Unusual Virginia Quarry Development Attracting Considerable Attention 61

An illustrated description of the operations of the Liberty Lime and Stone Company at Rocky Point, Virginia.

Ganister Rock 71

A discussion of the occurrence and utilization of ganister rock by J. D. Hartman, President Calcium Products Company.

Lime in the Treatment of Trade Wastes 73

E. B. Besselievre, a sanitary engineer, discusses the method of treatment and the advantage of lime.

Blasting in Quarry and Open Pit Mining 75

The fifth of a series of articles on this subject by R. N. Van Winkle. The sixth and last article of the series will appear in the next issue.

Kiln Performance 81

The fifth of a series of articles by Victor J. Azbe, a combustion engineer, dealing with the factors governing modern lime kiln capacity and fuel economy.

Pass it on

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Vice-Pres.

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Treasurer

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1—Here's how the Barber-Greene vertical boom digs. It's down almost 7 feet here. This ditcher is working for the Birmingham Electric Company.

2—Sailing along on a 17 mile pipe line job between Joliet and Aurora, Illinois. This machine was put on this long job in preference to larger—and clumsier—machines which the Western United Co. had on hand.

4—In close quarters. A head on view of a Barber-Greene coming out of a narrow Chicago alley. Here's a tight corner where hand labor has always reigned supreme. And remember there's a lot of real digging speed coupled with Barber-Greene handling ease.

Tear this out and send for the paper "The Use of Small Trenching Machines," delivered by A. G. Ford of the Western United Gas & Electric Co., before the 21st convention of the Illinois Gas Association.

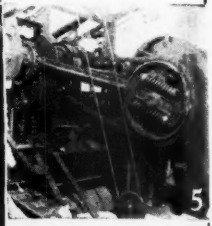
Name .....

Address.....

City.....

State.....

3—A Barber-Greene cutting trench for curb and gutter forms through an outcrop of coral rock in Florida. The speed here is but 3 feet per minute. But the Barber-Greene cut through it.



5—This overload release sprocket guards the Barber-Greene from the shocks of encountering hidden obstructions. It releases and locks automatically. When the load on the bucket is removed the sprocket automatically starts them digging again.

Here's Why They're Buying Barber-Greenes

The East Bay Water Company, Oakland, California, dug fourteen miles of 18" x 3½' ditch at a cost of 4.79 cents per lineal foot with their Barber-Greene. This figure includes all possible digging items—interest on the investment, depreciation, upkeep, operation, incidental labor and cost of moving the machine from job to job.

Most of the digging was short run stuff. That makes the low cost per lineal foot still more remarkable. And it makes it easier to see why more and more companies are buying Barber-Greenes.

A Barber-Greene is fast on its feet. This handiness goes farther than dodging in and out of tight corners. It is translated into real digging speed.

A Barber-Greene walked through 5,000 lineal feet of trench during its second day on a Texas pipe line job.

That's another reason why they're buying Barber-Greenes. And there are still more. The vertical boom digs straight down. The Barber-Greene seldom loses more than its own length in digging up to an obstruction. And the vertical boom digs service laterals flush with the main ditch.

The full length crawlers turn the Barber-Greene in its own length and permit it to trench across rough or soft ground. An overload release sprocket protects the ditcher's mechanism from the shocks of encountering hidden obstructions. It makes the Barber-Greene as careful as human hands in digging around buried pipe.

That's why they're buying Barber-Greenes. The Barber-Greene is a fast, hard-hitting, comparatively small machine. It's easy to handle. It's easy to hold to line and grade. It digs a clean ditch. And it's fast on its feet. Yes, it's easy to see why they're buying Barber-Greenes. Filling out the coupon in the upper right hand corner will give you a more complete story. It will bring you A. G. Ford's paper, "The Use of the Small Trenching Machine," and the latest Barber-Greene collection of ditching job pictures and information.

BARBER-GREENE COMPANY, 490 West Park Avenue, Aurora, Illinois

Representatives in fifty cities

BARBER GREENE

Portable Belt Conveyors Self Feeding Bucket Loaders

Coal Loaders . . Automatic Ditch Diggers . . Coal Feeders

Pit and Quarry

Vol. 10 Chicago, Ill., August 1, 1925 No. 9

The Case of John Doe

OPINIONS held by leaders in the non-metallic industry are interesting and valuable. They should be passed along. It is with keen satisfaction that the editor of this publication comes in contact with the varying ideas of producers in different sections of the country and in different phases of the industry. These men are practical and forward looking; they are concerned with only one line of business yet are alert for any indications of changes that may affect the future.

Not long ago a conversation with one of the prominent men in the industry furnished the editor with some interesting facts and conclusions. The case of John Doe was under discussion. There was a producer who after ten years in the business found himself on the easy side of the street. His business was well established and profitable and would under prudent management continue so; his surplus was growing; the future seemed secure. "Now is the time to live," he said, to the great delight of his wife and children. With a firm belief that they were rich they looked about them. That belief served to give a different aspect to the things which formerly they had prized. The home was no longer satisfactory; it suddenly seemed shabby and undesirable. Every phase of life changed to correspond with their changed attitude toward life. They all felt rich, and conducted themselves accordingly. A new standard of living was adopted; a new and expensive social standing was maintained. This meant more servants, expensive amusements and travel, clothing, cars, all the things that went with the feeling that they were rich. In reality they were not rich. The business rating remained the same while the social standing soared. Just at the time when the man should have built up an investment income that would have made him and his family secure with abundance if his business should decline, he made the fatal mistake of fancying himself rich and beyond the possibility of danger.

What invariably happens in the case of John Doe? He takes a chance when he assumes that his prosperity is impregnable. Like all men he enjoys taking the chance. He gambles with the future. And what does the future hold for him? There comes a year or two of bad business. The surplus has long since vanished in the new scale of living. Retrenchment becomes necessary. This is always distressing and humiliating, but doubly so when the family must share in it. Consequently that is put off as long as possible, often too long.

At the end of ten years John Doe finds himself at a place where it is hard to live. At a time when he should be protected by a sufficient and safe investment income, he faces the prospect of a struggle throughout his closing years. He thought that he was rich too soon, and the result was disastrous. It was a false rise and brought a sure decline. It was a most distressing situation, this case of John Doe.

It is probable that our business adviser did not realize how many John Does he was describing in the industry. During the past ten years we have seen other producers reach this same point and make this same mistake. At the present moment we believe that profits in certain non-metallic industries indicate that there will be still others who will make this mistake. Who can prophesy what the consumption of hydrated lime, gypsum, cement, sand and gravel, crushed stone, slate, etc., will be ten years from now? Invention and public opinion are factors which hold an indeterminable influence on conditions in the non-metallic industry. These conditions should have been considered in the case of John Doe.

Action Needed

WHILE it is generally conceded that it is impossible for anyone other than a rate expert to analyze the freight rate, even for a short distance, producers should not be asleep to legislation affecting freight rates. The Hoch-Smith Resolution, passed by the last Congress, orders the Interstate Commerce Commission to conduct a thorough investigation of the methods used in determining what are reasonable and just rates with a view to reducing rates on farm products in such a manner that the gross revenues of the railroads shall not be disastrously reduced. The Interstate Commerce Commission has, as many know, been working in this direction for many years. However, nothing very definite has been accomplished by the Commission in the past to simplify the freight rate structure in the United States.

The significant fact in connection with the Hoch-Smith Resolution is that others besides the railroads suspect that there is something wrong with this intricate and complicated freight rate structure of ours. It is hard to believe that there is any rational system in effect at the present time for determining freight rates. It is probably hard for any one except an expert to determine just what a reasonable rate should be, but it is easy to see the outrageous discriminations that exist in certain sections of the country affecting the non-metallic industries. As an example of such a condition we might call attention to the situation as regards one railroad in Michigan that makes a habit of giving favorable rates to producers who can choose between that line and some other, but which sets a rate out of all proportion to the producer who has no choice but must ship over the road in question. It is with the knowledge of a few such cases that we have made arrangements with a well known firm of traffic advisers to investigate and expose inconsistencies in freight rate structures as they affect the non-metallic industry.

While it has often been said that associations should not adopt a legislative program, we recommend that all associations in the non-metallic industries consider the opportunity for presenting information on their individual products if for no other purpose than to prevent an increase in rates to permit a reduction in the rate on farm products.

A Move In The Right Direction

ADVERTISING to the public at large has at last been undertaken by one unit of the sand and gravel industry. The Illinois Sand and Gravel Association, in the interests of good concrete and of sound construction, has contracted for $5000 worth of advertising space in twenty-six of the larger downstate newspapers. The purposes of this campaign is to convince the public that unprepared sand and gravel, hauled from creeks and banks, contain dirt and organic matter which prevent the cement from performing its functions properly. Such sand and gravel are unfit, therefore, for use in any kind of construction.

This advertising campaign began on June 14th in the Sunday issues of the papers selected. These advertisements are to appear weekly for a period of three years at least. This campaign has been augmented by letters sent to railroad officials and architects not only advising them of the advertising campaign but requesting them to give their support.

An enormous tonnage of sand and gravel hauled from local deposits, without any attempt being made to wash or properly grade it, is being used, not only in Illinois but in every other state. These wayside pits and temporary operators are not interested in building a reputation or an institution in the sand and gravel industry. Recognized authorities outside the sand and gravel industry have proclaimed many times that durable, clean, well-graded aggregates are absolutely essential if good construction is to be had where these materials are involved. This is the first time, however, that a state association of sand and gravel producers has made an organized effort to reach the public. The increased tonnage that should result from this campaign will more than offset the cost. The Illinois Sand and Gravel Association has made a move in the right direction.

Two Different Methods Utilized To Produce From Same Deposit

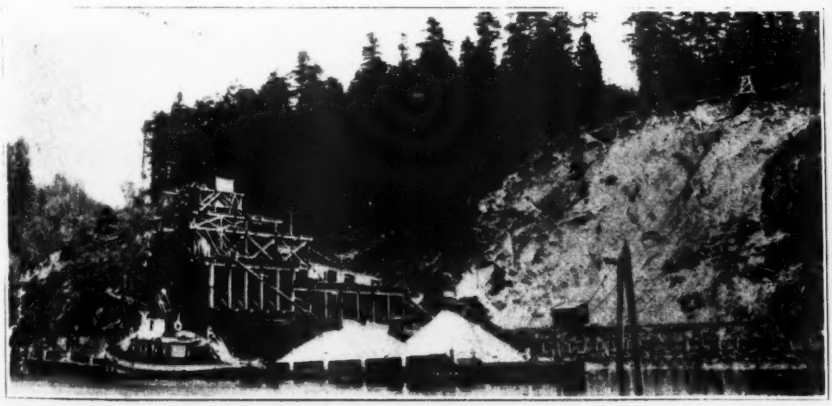
The State Gravel and the Pioneer Sand and Gravel Companies Operate Adjoining Properties By Entirely Different Methods

DIFFERENT methods are being employed by two producers operating adjoining deposits with practically identical conditions. The Pioneer Sand and Gravel Company is operating a plant at Pioneer Pit, while the State Gravel Company has only this last month started working a pit at Gravel Center, Washington, adjoining the Pioneer Pit.

The deposit from which both producers are securing their material is commercially all that could be desired. It is of glacial origin supposedly the head of the great moraine from Mount Ranier. It is on Puget Sound near Steilacoom and about 28 miles from Seattle and about 10 miles from Tacoma. The deposit rises from the sound on a 35 degree slope to an elevation of 240 feet above low water. The top 18 inches is black soil under which is a horizontal layer dropping down to an elevation of 200 feet of well graded sand and gravel. The material below the 200 foot elevation is heavily stratified dipping toward the bay at an angle of approximately 35 degrees with the horizontal. These stratas vary in thickness. Some are 40 feet thick of pure gravel from ½ to 3 inches in diameter and absolutely devoid of sand. Other strata are of pure sand while others are a very good mixture of sand and gravel. The sand strata are generally down near the water level with the gravel toward the top of the bank. The pit run is about two-thirds gravel and one-third sand with the exception of the coarse gravel over three inches which constitutes about four per cent.

The market served by this deposit is served by both rail and water shipments. Both the Pioneer Sand and Gravel Company and the State Gravel Company ship by scow directly into Seattle and Tacoma, and they both also ship over the Northern Pacific and the Union Pacific Railroads to inland towns and highways throughout the state. The market served by these two companies from this deposit consumes considerably more than a million yards annually.

Up to this point conditions have been practically the same. However different methods of producing the material are utilized by the two companies. The Pioneer Sand and Gravel Company, which has been producing material from this deposit for several years, is using hydraulic methods to move the material and flat stationary screens to grade and wash the material. The State Gravel Company, which has only just put its plant into



Water View of Plant and Pit of the State Gravel Company

operation, is handling the material dry and using conical screens to wash and separate the material.

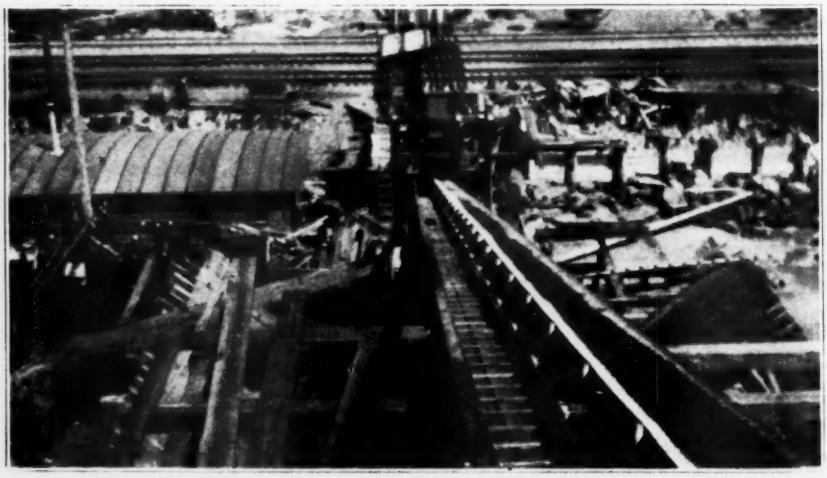
The Pioneer Sand and Gravel Company Method

The Pioneer Sand and Gravel Company, during the early years of operation, built bunkers of about 2000 yards capacity and sluiced the material to the bunker. As the hill pitched sharply into the bay, the bunker was built on piling and no provision was allowed for storage. The excess of any particular material was dumped into the bay as waste. In this manner about 1,000,000 yards were produced at one set up and evidently at an economical cost. Then another bunker would be built a little farther down the bay, and the pumps would be moved and the old bunker abandoned. This method served its purpose when the quantity of material shipped was small and when one set-up would serve for five or six years. But the market expanded rapidly and methods were changed.

The Northern Pacific and the Union Pacific Railroads built main lines through the deposit against the toe of the slope. This made it necessary to move the bunkers over 100 feet farther into the water resulting in less bank available for sluicing. Then it became necessary to adopt a modification of a strictly hydraulic operation which is the present method of operation.

The present set up consists of two scow bunkers and two rail bunkers with capacities of 2,400 and 600 yards respectively. The same set up existed three years ago at the time it was decided that the bank available for sluicing into these bunkers had been worked out. The bunkers were still in good condition, and all the plant equipment was concentrated about them. To build new bunkers would have involved quite an expense and would only have hastened the day when it would have been necessary to elevate the material. So it was decided to clean up the old sluicing level to the elevation of the docks. They also figured that this would give considerable space that could be used for storage room for the seasonal excess of material such as fine gravel in the summer and coarse gravel in the winter. When needed, this material could be reclaimed and in this manner the waste would be cut down considerably.

For elevating the material three hoists were installed because they wanted to keep a large area opened up where they might have some leeway in selecting material to meet the demand and to guard against delays from breakdowns. Two of the hoists are semi-automatic, 135 H.P. electric. The third is a manually controlled 200 H.P. electric. The first two elevate from hoppers set in about 300 feet from the original face of the pit and just enough above the tide water to allow for drainage. The 200 H.P. hoist elevates from a steam shovel



Loaded Belt and Conveyor in the State Gravel Plant

1,000 feet from the beach digging down to tide water.

The sluicing to the hoppers is identical in operation to that formerly employed throughout the pit. On account of the peculiar stratification of the pit, they do not use one large giant feeding flume for the reason that the water will not flow across the heavy strata of gravel but disappears the instant it reaches the loose gravel. For that reason they take off from the main pipe line laterals of 6 inch slip joint pipe which terminate in heads having two or three outlets. To each outlet is fitted a 50 foot section of 2½ inch fire hose. The discharge end of this hose is provided with a nozzle made by inserting a 12 inch piece of 2 inch pipe, reamed out at both ends. The flumes are built of 4 foot sections, the main flumes being 14 inches wide made up of 2 inch by 14 inches S4S bottoms and 1 inch by 12 inches rough sides. The lateral flumes are of the same construction, but 12 inches wide. In starting a flume a section is dug into the bank and set on a 12½ per cent grade. The sides flush to the top of the box are tamped in with sand. Two hose, one on either side of the flume, are set so that their water will discharge on the material to the side of and near the end of the box, if sluicing in gravel carrying considerable sand. If sluicing straight gravel, the hose are generally set so that they play on the material in the box, the material being brought to the box by playing the stream on the bank for a few moments. When the bank will no longer slide into the box, the material is washed out for 4 feet immediately in front of the box with as little disturbance to the standing bank as possible. A box is then hastily placed and tamped, the bank poled for another slide and the process repeated. A good sluicer, by watching his work, will lose very little water in coarse gravel. When sluicing in sand there is hardly any loss. The third hose is used when straight gravel is encountered and is pointed in the direction of the flow of material and acts as a chaser. The flumes are kept plated with chrome steel ½ inch by 12 inches right up to the bank. When straight coarse gravel is sluiced, it is hard to move even on the plates and the heavy grade. A 50 foot section of hose is used to make it possible to get over more ground with one flume, and also to give the sluicer a chance to get away from slides.

The hoppers are fed by three flumes each capable of carrying 50 yards per hour. The hopper is divided into 12 bins, four to the flume, which serve as settling or dewatering tanks. A man stationed on top of the hopper

The State Gravel Pit After Having Been Stripped

fills the proper bins and signals to the loader underneath as to the proper bin to empty.

Two cars tied together, with a haul back on a double track, are used at number 1 hopper. The cars are 4 yards capacity of the side dump type and are drawn up a 45 per cent slope to the dumping ramp on the old sluicing floor by an automatic hoist. This dump has a storage capacity of only a hundred yards as the material is sluiced to the bunkers as quickly as it is hoisted. The small storage is provided to take care of short interruption in the operation. The operation of the hoist is automatic throughout except for the loading of the cars. When the car comes under the proper bin of the hopper, the loader pulls a switch opening the operating coil on the primary closing jack of the motor. When he has the car loaded, he closes this switch. The car starts out slowly, picking up speed as the master switch on the motor cuts out the secondary resistance. When it reaches the ramp, the master switch cuts in resistance and slows down the car as it dumps. At the end of its travel, it trips a reversing switch which reverses the motor and starts the car back again.

The other automatic hoist lifts from a number 2 hole, which is an operation identical to number 1 hole except that a 6 yard skip car dumps on a ramp with about 200 yards of storage. A third hoist takes care of the output of the steam shovel. The hoist is manually operated and is a two drum arrangement handling two 10 yard side dump cars on a double track system dumping on a 50 foot trestle to an 8,000 yard stock pile on the old sluicing floor.

The shovel is of the full circle type mounted on standard railroad wheels and track and is equipped with a two yard dipper. It is working a 150 foot face. To avoid slides and danger to men and shovel, a small stream of water is run over the top of this bank in front of the shovel. This keeps the slope flattened out and easily keeps the shovel in material. This shovel working eight hours a day will average 1,600 yards per shift every day in the month.

From the two automatic hoists and shovel dumps the material is sluiced to the railway and scow bunkers, an average distance of 300 feet. Although the material is naturally exceptionally clean, sluicing this distance gives it a thorough scouring, and if there were any dirt clinging to the sand or gravel, it would be pretty well scrubbed off by the time the material reached the bunker.

The method of separation is a little different from that commonly employed in most plants. The arrangement used is a direct result of the hydraulic operation when the controlling factor has been elevation. A loss of one inch on the bunker resulted in a loss of 1,000 yards in the

The First Sand and Gravel Elevated at the State Gravel Pit

pit; so the bunker was built low, short and squatty with minimum clearance and not too much capacity.

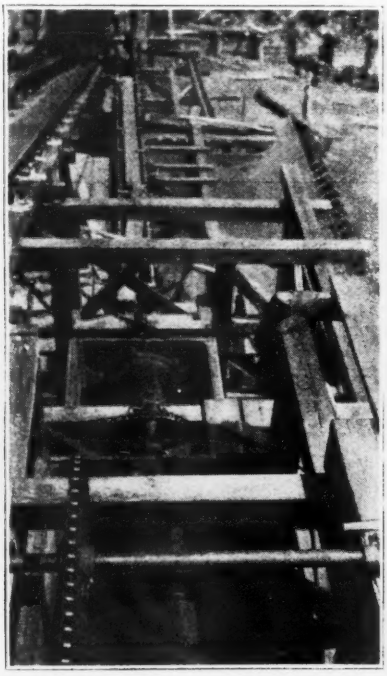
The material, upon reaching the bunker, passes over a sand screen in the bottom of the flume where part of the sand is taken out. It next enters the revolving grizzly. The rejects pass down the oversize chute to the crusher and are returned to the flume under the grizzly. Just before the material hits the main bumper sand screen, it passes over another sand screen in the bottom of the flume where more sand is removed. The remainder of the sand is taken out on the bumper screen and delector screen. The delector screen serves to split the gravel to either side of the separator where it is again split over the hip screen which removes the fine gravel. The coarse gravel rolls off the fine gravel screen to the coarse gravel bins directly under the separator. The roofing gravel is removed from the fine gravel directly underneath the fine gravel screens. The fine gravel is chuted to bins to either side of the coarse gravel. The roofing gravel is flumed away to bins at the side of the bunker, and the sand is carried to settling boxes where paving and building sand are recovered by a gravity separation. The grizzly used is manufactured by the Washington Iron Works of Seattle and is a very efficient piece of equipment for this work. The separation on the rail bunkers is similar to that on the scow bunker.

To some producers this screening arrangement might appear to be a makeshift. However, it produces a well graded product at a minimum cost for upkeep and delays for repairs.

Material can easily be made to a certain specification. It is a simple matter to meet the varying demands of the specification inspectors by either changing the inclination of the screens or cutting in or out short sections. This is done in a few minutes and at little cost. One man is used on each bunker, and he looks after three separators which produce 150 yards per hour.

Two six yard skip cars are used for each bunker for loading the scows. The cars operate on four tracks under

The 72 Inch Conical Screen



One Side of State Bunkers

the bunker, which converge to two at the tipple. The cars are loaded through sliding doors under the bunker, four 12 inch x 12 inch doors per car, and are operated by a double drum steam hoist. With both hoists running 800 yards per hour can be loaded.

The water for sluicing is furnished by two double volute 14 inch Cameron pumps, in series, pumping against a head of 160 feet, with a capacity of 5600 gallons per minute. To take care of this peak demand they have in reserve three old steam pumps with a capacity of 2500 gallons per minute, which were in use before electricity was available.

The Pioneer Sand and Gravel Company operates four distributing bunkers in the city of Seattle. All the material moves to these bunkers by scow from which it is unloaded by clamshell buckets. The Spokane Street bunker is a new site and under construction. Temporarily the material is being handled by a floating derrick operating a clamshell bucket to five small hoppers. A warehouse, bunker and storage yard for 6,000 yards are now being built. When this set-up is complete, the material will be unloaded from the scows with a Link Belt crane using a clamshell bucket.

At Westlake a stationary electric stiff leg operates a two yard bucket to bunkers of 600 yards capacity. At Latona an electric stiff leg derrick traveling on top of a 600 yard bunker unloads the material. At Rainier Beach the company operates a regular Stephens Adamson washing plant with conical screens and automatic Link Belt sand settling tanks, except that the material to be washed is brought to the bunker on scows from Cedar River, some 10 miles away, and is elevated to a hopper on top of the bunker by a Gentry crane handling a clamshell bucket. The hopper is equipped with a reciprocation slide gate to supply the two sets of conical screens with a steady feed.

Central Pit has a capacity of 1,500 yards per 24 hour day and is operated principally for plaster sand. The bank at Central is 165 feet high and runs heavy to sand. It is also worked by the hydraulic method. On account of the compact formation they use a giant and one large flume dividing at the bunker into two flumes. The bunker has two separators of the stationary inclined screen type. Blaw Knox buckets are used in all operations.

The Pioneer Sand and Gravel Company operates seven scows of its own, five of them being of 400 yard capacity, and two of 700 yard capacity. About 50 per cent of the output of the pits is handled by foreign scows provided by contractors letting out their own towing. The company ships by water within a radius of 200 miles and four to five hundred miles by rail. The long train haul is accounted for

Side View of Bunkers and Washing Plant of State Gravel Company

by the exceptionally high quality of Pioneer Pit material and the difficulty of obtaining good sand and gravel inland. Of the material handled by the company about 70 per cent comes from Pioneer Pit, 15 per cent from Central Pit, 8 per cent from Rainier Beach and 7 per cent from other sources.

Mr. H. F. Ostrander is president of the company, Mr. D. L. Williams, manager, and Mr. Paul Jarvis, superintendent of Pioneer and Central Pits.

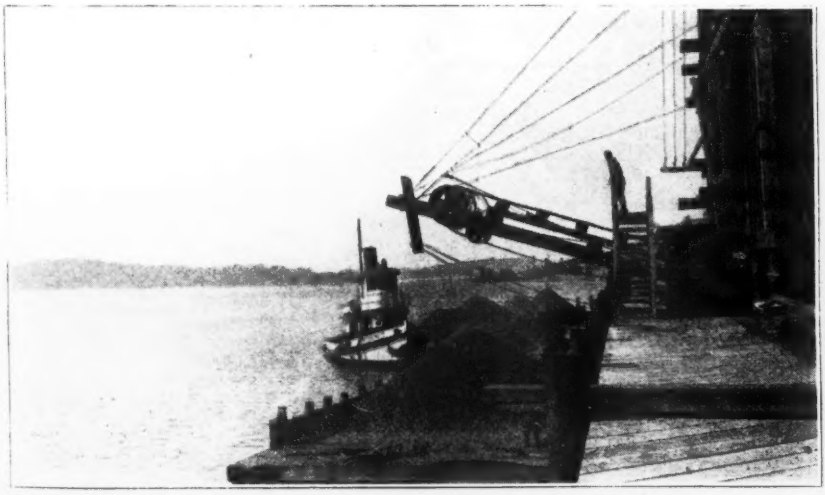
The State Gravel Company Method

The State Gravel Company has decided to operate its portion of this deposit by different methods. Its deposit consists of a tract of land of 185 acres with water frontage along Puget Sound of 2800 feet, and 2000 feet frontage along Chambar Creek which flows into Puget Sound. The Pioneer Pit is north and adjoining this property. A Sauerman two cubic yard Crescent power drag scraper with a 300 foot span digs and conveys the material to a hopper for elevation to the washing plant. This scraper is operated by a 75 H.P. Sauerman electric scraper hoist. This hoist has a speed of 200 feet per minute on the front drum for digging and in hauling and a speed of 600 feet per minute on the rear drum for back hauling. An interesting feature of this installation is the use of Sauerman roller-bearing blocks equipped with Timkin roller bearings. This enables operations to continue for at least 30 days with one oiling.

While the Pioneer Sand and Gravel Company brings the material over the railroad tracks the State Gravel Company carries it under the tracks by a tunnel conveyor. The scraper discharges to a hopper from which the material is fed by chute to a 24 inch belt conveyor, 140 feet centers, which conveys the material under the railroad tracks and up a slight angle to deliver to a Burch grizzly. This revolving grizzly separates out the oversize which is all material over 3 inches. At the present time this oversize is wasted, but a crusher will be installed later so that this material can be utilized.

The material passing the grizzly is elevated by another 24 inch belt conveyor inclined at an angle of 18 degrees to a saddle where the material is split, half going to each side of a double washing and screen plant. The two conveyors will handle 100 yards of marketable material per hour.

The gravel washing plant consists of two lines of Gilbert conical screens, three screens in each line. The material passing the first screen goes to the second screen, and the retained coarse gravel drops through chutes to a stationary screen where water is sprayed over the gravel washing out any sand. This coarse material is then passed to bin number one. That



Loading Belt and Tipple at the State Gravel Company Dock

material which passes the 1⅜ inch perforations in the first screen and which is rejected by the second screen passes to bin number two. The material passing the ½ inch perforations in the second screens and which is rejected by the third screen passes to bin number three. The material passing the ⅜ inch perforations in the third screen passes to flat screens over wooden sand settling boxes. Coarse, fine and roofing gravel are produced in this manner while concrete sand, medium sand and plastering sand are also separated. If the pit is running too heavy to sand, a quantity can be washed and wasted if desired. Both the sand and gravel produced are extremely well graded and also clean and durable making a high test concrete.

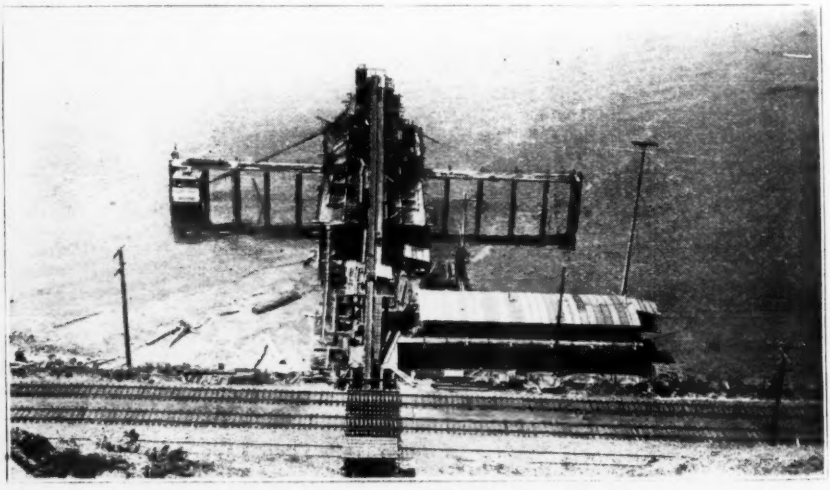
The bins have a storage capacity of 1500 yards and are hopper bottomed. Material for scow loading is drawn through gates at the bottom of the bunkers onto a 36 inch belt conveyor which has a speed of 400 feet per minute. For car loading, material is drawn through gates onto a 24 inch belt conveyor running at a speed of 300 feet per minute. These conveyors are electrically driven. All belts are motor driven and, with the exception of the scow loading belt, are direct connected. The scow loading conveyor has a maximum capacity of 600 yards per hour which permits very rapid loading. The scows dispatched from the plant carry from 100 to 600 yards with the average in the neighborhood of 400 yards. An average scow can easily be loaded in one hour. There are a total of six motors in the plant aggregating 230 H.P. All these motors are equipped with Timken roller bearings.

The pump foundation and house rests on creosoted piling, and the discharge pipe is operated by cable from the pump house to the bunkers. In this way it is independent of the wharf or any vibration due to landing of the tugs or scows. The pump which is of Allis Chalmers manufacture is motor driven and has a capacity of 1000 gallons per minute. The Burch grizzly, the Gilbert screens, and all belt conveyors were furnished by the Stephens-Adamson Manufacturing Company.

The State Gravel Company maintains offices in Tacoma and Seattle. Mr. W. R. Nichols is president; Mr. Fred T. Sherman, vice president and general manager; Mr. Harold K. Nichols, treasurer; and Mr. Scott Z. Henderson, secretary. Mr. D. C. Stapleton is superintendent.

Another Florida Sand Company Organizes

Lakewales Concrete Sand Co., Lakeland, Polk County, Florida, $50,000 8% cumulative preferred stock and $200,000 common; officers and directors, A. F. Pickard, President; W. S. Dresser, vice-president; W. H. True, secretary; E. L. Mack, treasurer; W. R. Hannah, George S. Parker, E. E. Calloway, T. H. Burruss and Robert P. Thornton, directors.



View From Top of Bank at State Gravel Company Pit Showing The Boarding House and Office at Right

Analyzing Freight Rate Problems In The Non-Metallic Industries

Written Expressly For Pit and Quarry By L. E. Whitney

THIS article will introduce to the readers of Pit and Quarry Mr. Whitney, who is a member of the firm of Gorman and Whitney, traffic advisers. This firm of experts is conducting a special investigation for Pit and Quarry in certain freight rate matters as they pertain to conditions in the non-metallic industries.

Freight rates have such a bearing upon the market for products in the non-metallic industry that a careful analysis and exposure of some of the inconsistencies as they actually exist will be of interest to our readers. Freight hauls are usually short in our industry so that adjustments are peculiarly local. There is a rate relationship however and some of the conditions to be described by Mr. Whitney as existing in a certain territory may also exist in yours.

Readers are urged to send to Pit and Quarry any freight rate problems and Mr. Whitney will analyze the problem and make his recommendations. It may be that you want to know if your rates are in line. Any and all problems submitted will be dealt with expeditiously.

Editor.

The Non-Metallic Industries are paying too much freight. Many producers in the non-metallic industries are today paying freight rates on their commodities which are deserving of considerable downward revision, and in many instances requests to the carriers for such action has been declined simply because all of the facts relative to this proposal have not been properly presented. And again, many requests for the establishment of rates being based on an incomplete analysis have had some measure of favorable consideration, where if the situation had been presented properly a much greater reduction would have resulted, and, possibly, wider markets opened up.

There are a number of considerations governing the establishment of freight rates that are exceedingly important to bear in mind in any effort to secure a readjustment. (1) The amount of tonnage that will be moved on the rate; (2) the amount of switching involved at both point of origin and destination; the character of equipment required for loading, whether box, stock, gondola or special equipment; the value of the commodity, and its susceptibility to loss or damage while in the carriers' hands; whether or not the movement contemplated will provide a loaded haul in the direction of empty hauls or vice versa, and rates carried on similar commodities in other territories under similar conditions, are a few of the many questions which must be satisfactorily answered before any proposal for a revision in rates can be hoped to be favorably considered.

The writer has in mind an instance where a firm with a large construction project requiring hundreds of cars of material sent a superintendent of construction to call upon the general freight agent of a carrier to secure a concession in freight rates. The rate at the time of such negotiation was supposed to be $1.46 a net ton, and this firm felt that quite satisfactory results had been accomplished when the carrier agreed to establish a rate of $1.39 per net ton. As a matter of fact, the rate which should have been established was $1.16 per net ton. The difference represents a dead loss to this firm of 23 cents a net ton on 25,678 tons of material, or $5,905.94. Such instances are not unusual and surely indicate the importance of the traffic expert when matters of transportation are considered.

Large industries save tremendous sums through the work of their traffic departments and get very preferential treatment from the carriers. Fresh meats and packing house products are carried at the low freight rates applicable on these commodities; this is directly traceable to the work of the traffic organizations in the packing industry. The same is true of the grain and milling interests, the coal industry and many other lines of business where traffic experts have been employed for many years.

To anyone unacquainted with the details of traffic work the question might naturally be asked, "What does a traffic manager do to get such preferential treatment at the hands of the carriers?" "How does he go about getting a required rate established, and what procedure is used with the railroads that results in a downward revision of freight rates?"

There are many freight rate adjustments that are in effect today that are peculiar when compared one with another, and it is the task of the freight traffic manager to straighten out these peculiarities insofar as they affect his particular industry, leaving competing firms to suffer restricted markets to the extent that they are lacking in such direction.

One such adjustment, that may be of interest for the sake of example, is that affecting the rates on sand from Willow Creek, Indiana. The Wabash Railway names a rate to Chicago, Illinois, on any kind of sand for local delivery on the Wabash of 63 cents per net ton, or 84 cents per net ton for delivery to industries on connecting lines at Chicago, and $1.01 per net ton for team track delivery. The Michigan Central names a rate on Lake, River or Bank sand from Willow Creek to Detroit, Michigan for local delivery on the Michigan Central of $1.26 per net ton with switching charges in addition for delivery to connecting lines. The same tariff also names a rate on Lake, River and Bank sand from Willow Creek, Indiana, to industries on connecting lines within the Chicago District of 88 cents per net ton, or four cents per ton higher than the Wabash rate for the same haul.

The following chart gives a picture of this rate adjustment:

From Willow Creek Ind.	To Chicago, Ill.			To Detroit, Mich.		
	For Local Delivery	For connecting delivery	Distance miles	For Local delivery	For connecting delivery	Distance miles
Michigan Central	$0.63	$0.88	38.2	$1.26	$1.26 plus swg chg.	246.6
Wabash	.63	.84	38.4	4.40	4.40	233.7

Now, keeping in mind that the distance from Willow Creek to Chicago is only 38.2 miles, and the distance from Willow Creek to Detroit is 246.6 miles, what should be the position of the Chicago or Detroit users of sand from Willow Creek as to their rates? Or what should be the presentation of the demand of a producer at some other point in competition with sand from Willow Creek to Chicago and Detroit?

Certainly, the shipper at Willow Creek, Indiana, on the Wabash has just cause for complaint against his rate of $4.40 a net ton to Detroit, Michigan, when it is considered that a shipper at Gary, Indiana, on the Wabash has a rate to Detroit of $1.26 a net ton. The tariffs of the railroads are replete with maladjustments in freight rates as between competing producers or communities, of which the above is hardly more than a poor example.

To those contemplating establishing a plant it would seem to be important to have an expert in traffic matters analyze the situation from a freight rate standpoint before investments were made in machinery and equipment, for there is no industry in which the transportation cost occupies so large a place as in the handling of low grade commodities where the freight rate in many instances governs a market and the transportation cost exceeds the price of the material.

There are many items of transportation costs other than the freight rate, such as switching charges, demurrage charges, and sidetracks, which require careful analysis and constant vigilance in order that excessive charges may be avoided.

The writer has found many instances where the tare weight as shown on the freight bill was in error and the shipper actually paying charges on tonnage that was never hauled. For instance, the record of scale weight as shown on the freight bill would read something like 127,000 lbs. gross—34,000 lbs. tare—net 93,000 lbs; whereas, the actual tare weight of the car was 43,000 lbs., but the railroad employe in making the scale ticket incorrectly read the tare of the car, and transposed the figures. In the above instance the shipper paid transportation charges on 9,000 lbs. of material that was not in the car.

Analyzing a Trap Rock Operation

Written Expressly For Pit and Quarry By F. A. Westbrook

AMONG the various operations of the Connecticut Quarries Company, Inc. is one located between Plainville and New Britain, Connecticut, which cannot fail to have several points of interest for readers of Pit and Quarry. Local conditions, as must always be the case in any enterprise of this kind, have either proved helpful in furthering economical production or have constituted obstacles which had to be overcome. The effect of these will be plain enough.

Drilling and Blasting

The material quarried is trap rock—one of the very best for crushed stone on account of its great hardness. The formation of the rock at this quarry is very solid so that very large pieces are broken off in blasting thus necessitating an unusual amount of secondary drilling. For the same reason "tunnel blasting" does not work well in this instance—pieces equal in size to a large building having been broken off on experimental tryouts which were made not long ago. In other quarries belonging to this Company, however, where the formation is in pillars this method of blasting has shattered the rock very successfully.

At the present time two Ingersoll-Rand X 70 drills are kept going all the time during the busy season and also to a considerable extent in winter. A change was made not long ago from piston drills with the result that holes thirty feet deep can be made instead of twenty-five foot holes and the footage per day has been doubled. In addition to these X 70 drills there are four Ingersoll-Rand jackhammers for secondary drilling. There is no regular time set aside for blasting. It is merely done when the drillers are ready for it, which may sometimes be at intervals as much as a few weeks apart.

Handling Raw Material

The layout of the quarries and buildings conforms to good practice. The crushing machinery is located opposite the face of the quarry where the blasting is done, and a track runs along this face and past the jaw crusher. There are two small Vulcan steam locomotives and one Plymouth gasoline locomotive which are kept in service, and trains of small dump cars. These, together with the method of loading by means of a Marion Electric Shovel No. 37, are shown in the illustrations. At the jaw crusher there is a jib crane used partly for moving large pieces of stone which not infrequently catch

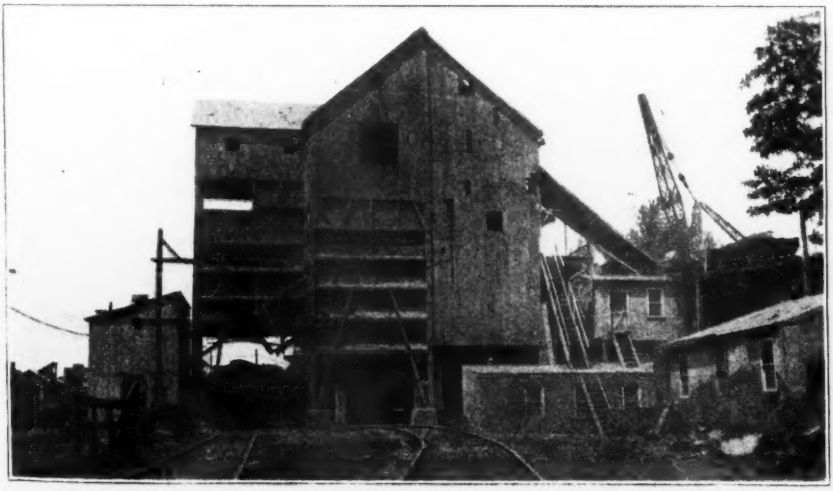


Figure 9—General View of Crushing Plant—Freight Cars and Trucks Are Loaded From Under the Bins

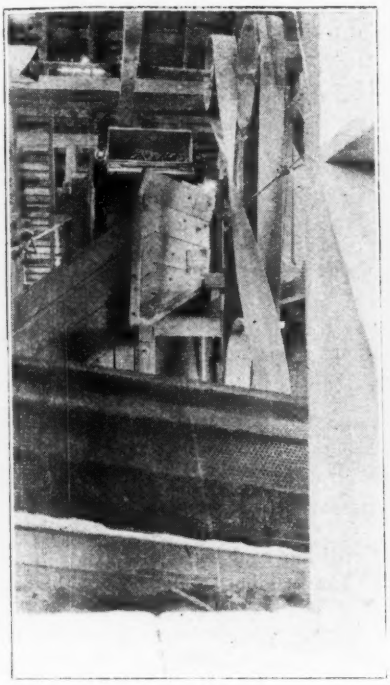
Electric Shovel at Face of Quarry

Quarry Face With Cars Ready to Load

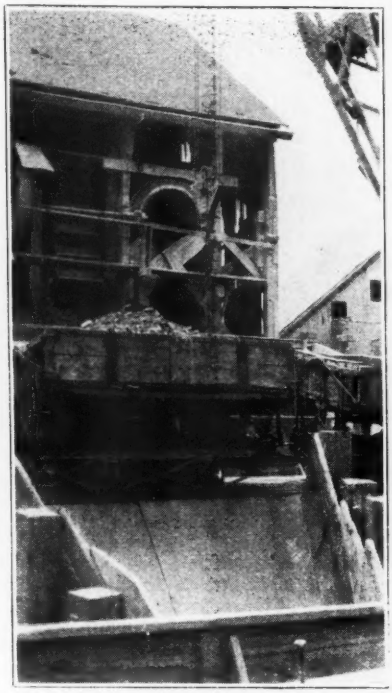
and form a bridge over the crusher, and also for handling parts of machines in the crusher plant.

The stone is first brought up in Western dump cars to within a short distance of the jaw crusher where the locomotive is uncoupled and shunted around the crusher station to the main line of track where it picks up a train of empty cars to pull over

The Electric Shovel Loading Dump Cars



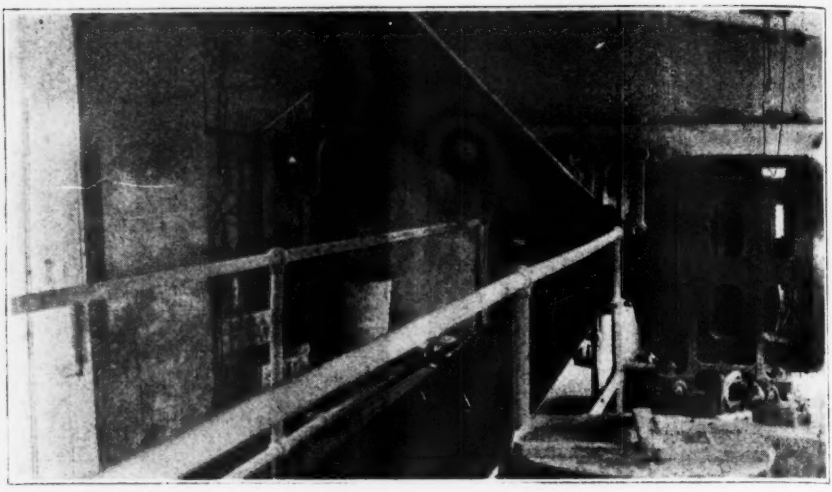
Bucket Elevator Discharging to Chute



Dump Car Ready to Discharge Load

to the electric shovel. As soon as more stone is wanted at the crusher, the train of loaded cars which has been dropped by the dinkey engine, is pulled up by means of a hoisting engine and winch. As soon as these cars are emptied, they roll by gravity down to the switch in the main-line of track where the dinkey engine passes around the crusher and where

Another View of Pit and Shovel Loading



The 200 HP Motor For Driving Main Crushing Plant

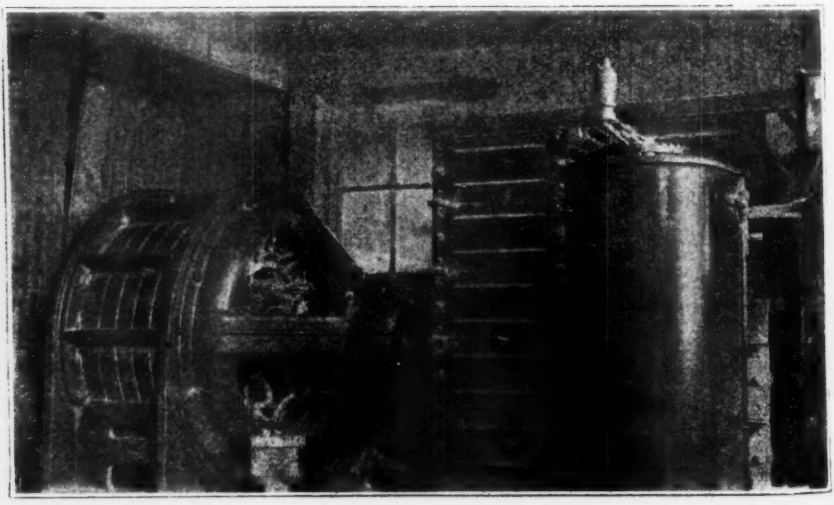
the latter can pick up the empty cars and pull them out to the face of the quarry. The distance from the crusher to this switch is sufficient to accommodate ten empty dump cars. This arrangement of tracks and switches is very practical and ingenious, making possible, as it does, the handling of one thousand to twelve hundred tons of stone per day by two locomotives. The originator of this arrangement, Mr. Louis Toffolen, Superintendent of the plant, deserves much credit for it.

Crushing and Screening

The product turned out in this plant is crushed stone in standard sizes, namely 2, 1¼, ¾, ½ inches and screenings.

The stone crushing operations are carried out in the following sequence:

All material is dumped directly into the 42x54 inch Buchanan jaw crusher. The material is then carried by means of a 48 inch Jeffrey bucket elevator which discharges into a number 8 McCulley gyratory crusher. It is then taken by means



The 150 HP Motor With Variable and Reversible Speed Control for Jaw Crusher

of a 42 inch Jeffrey bucket elevator which discharges into a 60 inch by 12 foot screen. Everything passes through this screen except pieces of 2½ inch in size, or over, and these drop back to a number 6 Gates and a number 5 McCulley crusher where they are recrushed down to 2 inches in size and then taken up with the other material by the 42 inch Jeffrey elevator to the 60 inch by 12 foot screen.

All material which passes through this screen, under 2½ inch in size, goes into a 22 inch belt elevator and is carried into a 46½ inch by 14 foot screen. This screen has a jacket with 1 inch mesh and all material passing through this latter goes by gravity into another screen which separates the ¾ inch pieces from the ½ inch and dust and a jacket around this separates the ½ inch from the dust.

There is a small secondary recrushing plant consisting of three Gates gyratory crushers. They are used when there is a surplus of 2 inch stone from the main crushing plant and when a demand exists for more of the smaller sizes, as frequently happens. A 20 inch belt conveyor takes the 2 inch material from the main plant and drops it into a number 5 Gates gyratory crusher. It is then carried by a 22 inch belt elevator to a screen from which the oversize pieces drop into a number 2 or number 3 Gates gyratory whence they are again elevated to the screen. This arrangement gives a degree of flexibility which enables the plant to make its output easily conform to variations in demand for different sizes of crushed stone.

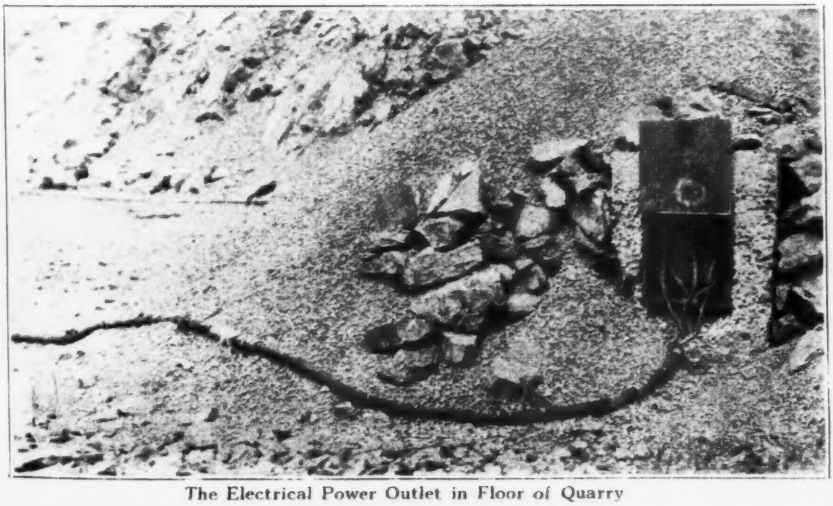
Loading

The different sizes of stone are, of course, automatically discharged into separate bins or tanks from which they are withdrawn as needed, by gravity. Railroad tracks pass under these and the spaces between the rails are paved so that both freight cars and motor trucks may load at the same point.

Empty freight cars are stored at one end of the plant and as the tracks have a slight downward grade toward the crushing plant, it is an easy matter to release the brakes and allow a car to roll, by gravity, into position for loading. When filled the brakes are again released and the car passes on to the other end of the plant to await the arrival of a locomotive to take it away. There is thus space for storing something like forty empty cars and about thirty loaded cars. The locomotive comes in once a day to bring a supply of empties, take away loaded cars and do whatever switching may be necessary. Thanks to the good management of the superintendent, there is rarely much of the latter to do.

Power Equipment

All machinery, except the crane at the jaw crusher, is electrically driven, but the principle of individual drive



The Electrical Power Outlet in Floor of Quarry

has not been carried out. Compressed air is furnished by a Sullivan compressor, size 17-9¾ x 12. It is driven by a 440 volt, 100 H.P. General Electric induction motor.

The jaw crusher is driven by a 150 H.P., 440 volt General Electric induction motor, equipped with variable and reversible speed control. A belt is used. The main drive for the rest of the crusher plant, including conveyors, is by means of a 200 H.P., 440 volt, Crocker-Wheeler induction motor. The small recrushing plant is driven by a 100 H.P., 440 volt, General Electric induction motor.

Central station electrical power is brought in at 11,000 volts to a transformer bank located in a small house and is stepped down to 440 volts, which it will be noted is the voltage at which all the motors operate.

There is a drill sharpening shop, consisting of an ordinary forge, an Ingersoll Rand heater and an Ingersoll Rand drill sharpening machine number 50. This is located in a small building of its own, conveniently situated but out of the way of other operations.

General

There is one particularly striking feature about this whole establishment which, unfortunately, is not found in all similar places—this is, scrupulous cleanliness and neatness. Mr. Toffolen undoubtedly deserves great credit for this outward and visible sign of his good management. The illustrations show this condition, as it was not necessary to do any picking up or kicking aside of rubbish before taking them. The result is that everything seemed to be running very smoothly and cheerfully, and the superintendent apparently had time to do some thinking, without which he could not possibly have his plant so well organized.

The distribution of the product is rather wide for this sort of material. The large amount of concrete construction now going on is, of course, responsible for this to a considerable extent, as is also the rapid extension of state road building in this region. Material from this quarry is shipped as far east as Cape Cod and westward across the border of Connecticut into New York State. On the other hand one of the Company's best customers is W. H. Hall and Company, who have an amiesite plant across the road and consume a substantial portion of the daily output.

Car Puller Bulletin

Mead Morrison Manufacturing Company has issued Bulletin No. 129 descriptive of their car-puller. This bulletin in addition to containing a complete description of the machine and its applications also contains a very lengthy list of some typical installations, some of which are illustrated in the bulletin.

Interior View of Tool Sharpening Shop With Heater on Left and Sharpener on Right

Unusual Virginia Quarry Development Attracting Considerable Attention

Liberty Lime and Stone Company Using Interesting Methods Working Two Quarries in Opposite Directions From Ravine

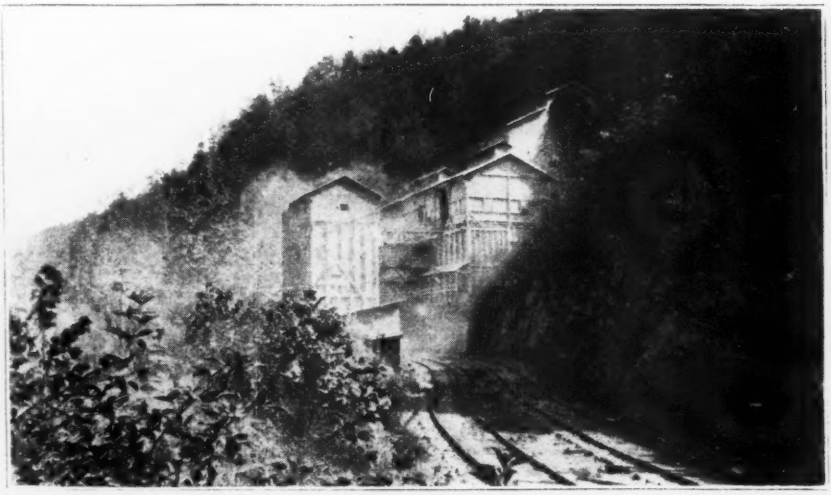
LOCATED in an isolated mountain section of Virginia at Rocky Point, on the Chesapeake and Ohio Railway only a few miles from Natural Bridge, is a development that is attracting much attention from large users of limestone in the chemical industry. This wonderful area, included within the territory adjacent to one of natures world wonders, furnishes opportunities for industrial development in lime, cement and their products as well as crushed and ground limestone for chemical and all other uses. The Liberty Lime and Stone Company has developed within the last five years a large deposit of very high grade limestone. This area lies within the Murat beds already made famous because of their importance in the development of scientific research. An Indian Rock, which is close to these developments, is a lime plant handling a product which is of great importance in the chemical developments of the present time.

The average results of many chemical analysis of quarry samples of this limestone, from research laboratories and private chemists are as follows:

CaCO	99.05%
MgO	.29%
Moisture	.14%
Fe_2O_3	.17%
$A1_2O_3$	.08%
$Si\ O_2$	.27%
So_3	0.0 %
	100.00%

Arsenic .20% parts by millions.

Of the quarries of the Liberty Lime and Stone Company there are two working in opposite directions from a ravine. At present these quarries are of the through cut or open pit type. The development, however, is being carried on in a way that will very soon combine the two into one continuous curved working face on a common quarry floor. The bedding seams of this deposit of stone are in many places several feet apart, thus rendering the quarry faces solid masses of stone. The dislodgment from place is, therefore, brought about as follows. From the surface to the floor of each quarry the average distance is one hundred feet. Shelves or steps about four or five feet wide and sixteen to twenty feet



Crushing, Drying and Pulverizing Plant

Train of Nine Cars Going to Tipple

apart are maintained from the top to the bottom of each working face. Ingersoll Rand jackhammer air drills are used on each of these shelves to drill holes only a few feet apart and from one shelf to the other. The depth of each hole is, therefore, 16 to 20 feet. These are loaded with 40 per cent ammonia dynamite in quantity sufficient to dislodge the stone and as far as possible reduce it in size at one blasting to be ready for loading. This method saves much blockhole drilling and blasting and reduces explosives cost to a minimum.

Loading in these quarries is done with the use of two automatic Thew circle swing, type 3 electric driven shovels. These shovels are built for medium light quarry service and combined they have a loading capacity of about 120 tons of stone per hour. One shovel is equipped with a car wheel truck and operates on regular quarry tracks. The other shovel is on tractor wheels and operates on the quarry floor. These shovels load the stone into Continental two-way, 6 yard side dump cars that are delivered at the working face by means of a Whitcomb 9 ton gasoline locomotive which also hauls back the empties. The Whitcomb locomotive, in addition to spotting all cars to the shovel, hauls the loaded cars to a transfer point on a side track at the working face where the loaded cars are picked up by an electric locomotive and hauled to the crushing, screening and grinding plant. The distance from the quarries to this plant is one mile, the connection being a well built 42 gauge railroad laid with 56 pound steel rails. This is electrified and the haulage is by means of one General Electric 15 ton mine

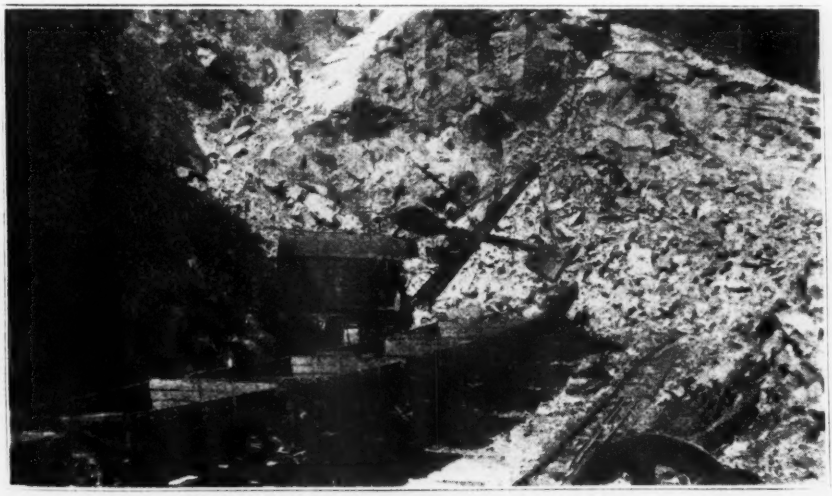
View of Quarry Number One

type locomotive. The grade of this track from the quarry is for the first 1000 feet O. The next 4000 feet it is 2.65 per cent with the loaded cars. Then the grade changes to a 1 per cent grade against the loads which extends beyond the crusher and enables the loaded cars to be landed on a plane from which they will pass by gravity to the crusher where they are dumped sidewise, and then on again by gravity to a side track from which they are taken empty back to the quarry transfer point with the same electric locomotive that brings down other loaded cars.

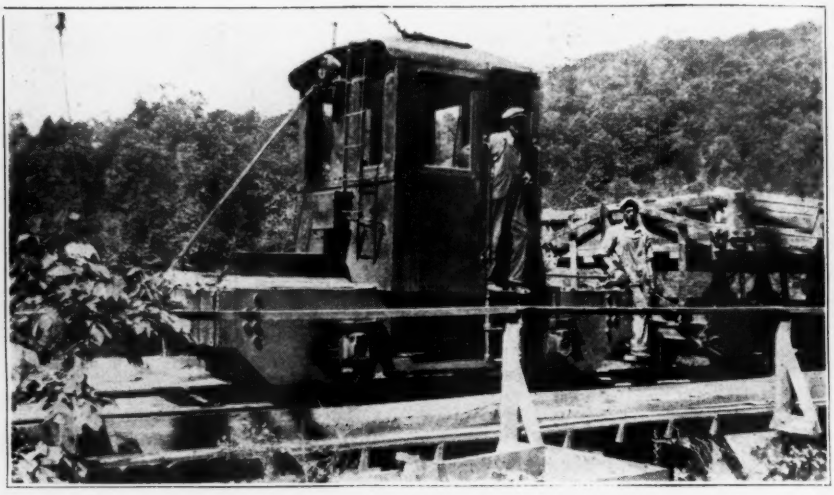
The cars are dumped one after another sidewise onto a Traylor "Sheridan" grizzly. The loaded cars are stopped at the unloading point only long enough to be emptied. The Sheridan grizzly is 12 feet long and 5 feet wide and feeds the stone into a 42 by 48 inch Traylor jaw crusher of the improved type. This crusher reduces to maximum size of 8 inches and discharges onto an apron feeder which feeds a 16 inch Traylor Bulldog gyratory crusher. This crusher reduces the stone to a maximum size of 5 inches and discharges it onto a belt conveyor that feeds a Traylor screen 6 feet in diameter and 20 feet in length. The first 10 feet in length of this screen is covered with perforated metal, the perforations being round and 1½ inches in diameter. The through material 1½ inch to dust is caught on an outer jacket of

Seven Yard Car Dumping to Jaw Crusher

the same screen. This jacket is also perforated metal and the round perforations are ¾ inch in diameter. The through material here passes onto a scraper line conveyor that takes it to a 54 inch by 12 feet screen that produces ¾ to ⅜ inch finished stone for the market and also ⅜ inches to dust. The 1½ inch stone in the 20



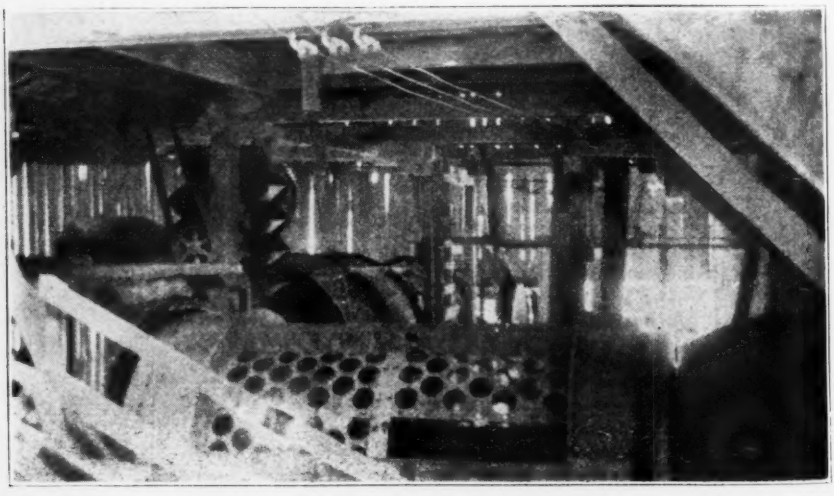
View of Quarry Number Two



The 15 Ton Electric Locomotive

foot screen passes onto perforated metal sheets where the stone from 1½ inch to 2 inches is separated first and then the 2 to 2½ inches. The oversize from this screen is discharged either into a bin for shipping or onto a belt conveyor that discharges into an 8 inch Traylor Bulldog gyratory crusher. In the material coming from the grizzly there is often considerable dirt. The dirt is separated from the stone by a 2 inch stream of water supplied by a 5 inch Gould pump. The dirt and water are run off through a 4 inch pipe.

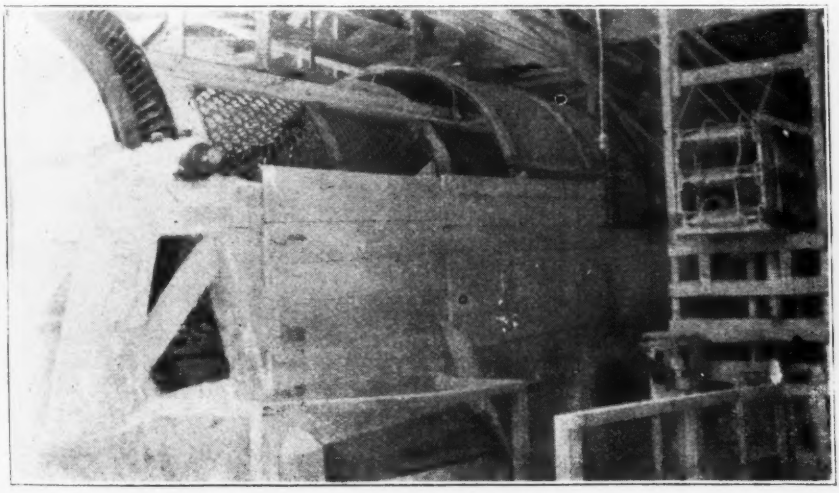
The 42 x 48 inch jaw crusher, as has been said, discharges onto an apron feeder. It can also be made to discharge into a Traylor 72 inches by 8 feet screen covered with perforated metal, the perforations being round and 6 inches in diameter. The oversize from this screen, from 6 to 8 inches, pass to a bin for supplying chemical plants that use this size. The undersize from this screen pass



Interior of Mill Showing One Section of Screens

Part Of A Day's Shipment

to the 8 inch gyratory crusher noted above. This crusher reduces the stone to a maximum size 2½ inches and discharges into elevator buckets on a chain elevator that in turn discharges into a Traylor 72 inch by 20 foot screen. This screen is a duplicate of the one that receives the discharge from the 16 inch gyratory crusher noted above. The metal jackets are perforated to size the stone to 1¼ inch to ¾ inch, 1¼ inch to 2 inches, and 2 inches to 2½ inches, or by means of a system of chutes and conveyors any or all of the oversizes may be returned to the 8 inch gyratory for further reducing. Thus may the entire product of the plant be reduced to a maximum size that is through 1¼ inch. From the second 72 inch by 20 foot screen the ¾ inch to dust material is carried to the 54 inch by 12 foot screen by means of a second scraper conveyor. It has been noted that the ⅜ to ¾ inch over size of this screen passes



Interior Mill View Showing One of the 40 Foot Screens

to a bin. The ⅜ inch to dust passes to a belt conveyor that discharges into a bin from which the product may be fed by gravity to a railroad car or to an American Process rotary dryer for drying and grinding.

The dryer is of the direct heat type 4 foot diameter and 30 feet long. It discharges into elevator buckets on a chain elevator that carries the dried product to a double jacketed screen from which it is distributed to bins for grinding. The grinding plant has one Williams pulverizer Number 3 for making ground limestone for agricultural use. The dust discharged from this pulverizer is elevated and dumped to a National vibrating screen fitted with removable panels of copper woven wire of fine mesh. A 33 inch Fuller-Lehigh mill has been installed for making filler dust to be used in the construction of sheet asphalt roads and streets and for the rock dusting of coal mines. This filler dust and rock dust formerly were waste products.

All stone, both crushed and ground, is discharged into bins and loaded in railroad cars that pass the bins on a gravity plane. Crushed stone is loaded loose in open top cars, and ground and pulverized stone is loaded either loose or bagged in box cars. A Bates Valve Bagging machine is used for bagging the filler dust.

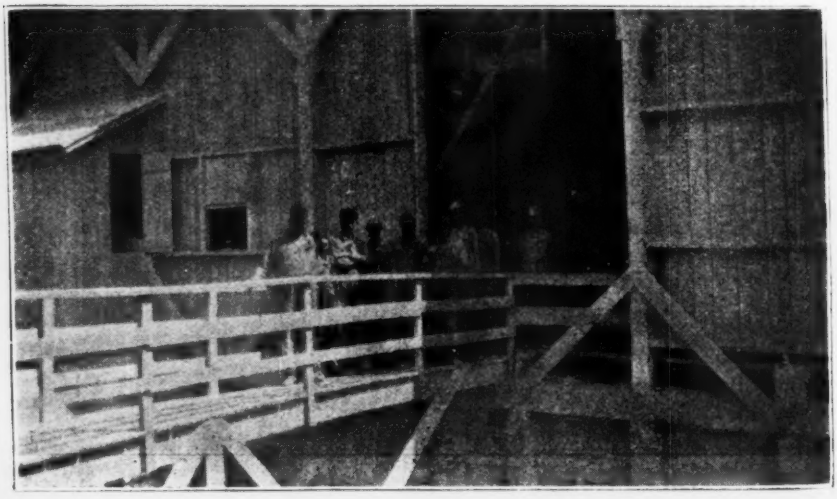
Major J. W. Stull is president and treasurer of the company; John C. Dillon is vice president and general manager and C. L. Archart is superintendent.

Open Vast Gypsum Deposit

Completion of one of the largest and most unique industrial developments of the year has just been announced by the Blue Diamond Co., a Los Angeles concern. A mammoth new gypsum deposit located on the peak of a high desert mountain about thirty miles southwest of Las Begas, Nevada, has been developed. The project according to company officials; involved an expenditure of more than $1,000,000; required the building of twelve miles of privately owned standard gauge railroad over the great American Desert, and finally, construction of a little town known as Blue Diamond on the crest of the highest mountain.

The Blue Diamond Company is one of the largest building materials units of production, manufacturing and distribution in the United States. To secure a mammoth supply of pure gypsum rock for the plaster mill in Los Angeles the development was undertaken. Thousands of tons of gypsum rock will be mined each month and shipped to Los Angeles for refining and manufacture into plaster. Already the new development has added substantially to the company's local pay roll as well as to the industrial expansion of the city.

Development of the project climaxed a three-year period of research and exploration by Blue Diamond engineers and chemists. During that period hundreds of tests were made. An airplane was used for topographical and geological observation.



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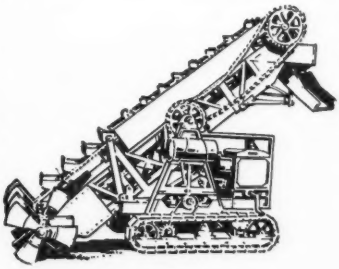

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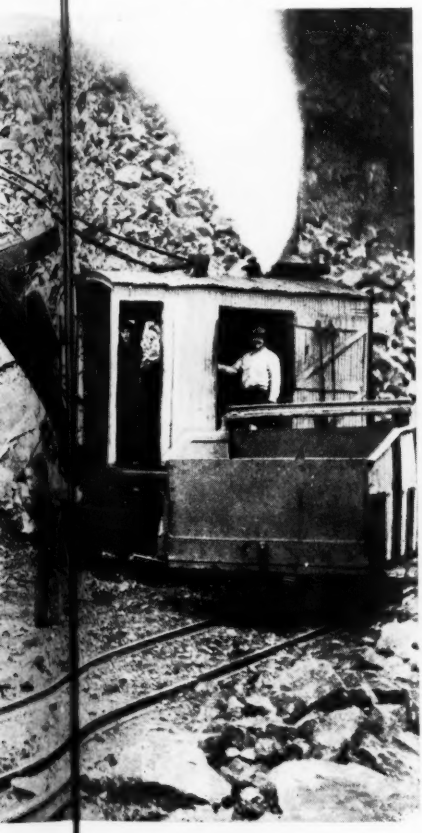

onnecticut Quarries Co., New Haven, Conn.

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(Signed) A. L. Worthen,
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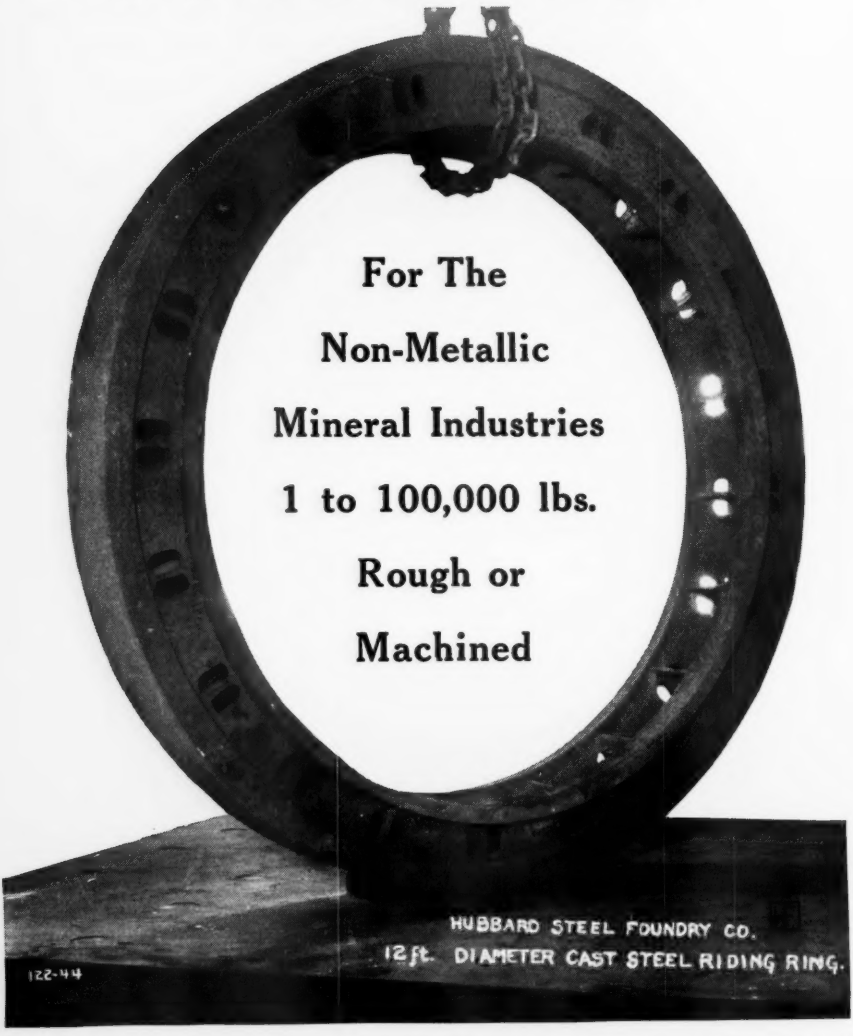

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Ganister Rock

By J. D. Hartman, President, Calcium Products Company

ONE of the principal minerals in Pennsylvania is Ganister Rock, a raw material used in a number of the state's most highly developed and important industries. The rock has a bright metallic lustre and exists in a variey of different colors. depending entirely on the percentage of iron content. The predominant color, however, is white, which is the best quality. Ganister is a commercial name only, the rock being an almost pure quartzite, with a silica content in the best qualities, sometimes exceeding ninety-eight per cent. The impurities,—iron, alumina, magnesia, lime, etc., exist in such small percentages as to be negligible, insofar as affecting the quality is concerned, excepting the color as already mentioned. It is a highly refractory material in that it offers great resistance to heat. Apart from its expansion it is not at all affected by temperatures ranging up to three thousand degrees Fahrenheit. Its difference from the ordinary sand rock is a physical one. Chemically, the analysis of each is quite similar. Its molecular structure is such that it has the physical property of expanding and contracting without disintegrating, when subjected to gradual and varying temperatures which do not exceed three thousand degrees. The rock is one of the hardest found in the state and offers great resistance to crushing and grinding.

Its occurrence, geologically, is in two different formations, the stratified and unstratified. In the former condition the rock ledge formations are exactly similar to the limestone deposits, while in the latter, the unstratified, the rock occurs in large oven and uncovered flows, lying on the crests and slopes of a range of mountains, parallel to the Alleghenies, and lying south of them. The largest and most important deposits of the mineral and the chief sources of supply are in Mifflin, Huntingdon, Blair and Bedford Counties. In these counties are located a great many silica-brick manufacturing plants, some of which are the largest in existence. Other scattered plants, obtaining their Ganister material from the counties mentioned, are located in Western Pennsylvania, and Eastern Ohio. The silica-brick plants of Pennsylvania produce approximately eighty per cent of the entire requirements of the United States. The rock is found in several other counties of the state, but the deposits are small and in most cases of an inferior quality.

One of the principal sources of consumption wherein the mineral is the chief raw material, applying as well to the past as to the present time, is in the manufacture of silica-brick. The raw rock is first crushed and then ground to about the size of sea sand. During the grinding lime water is added which serves the purpose of a bond to accomplish the moulding and drying processes to which the green-brick are subjected. When thoroughly dry, the brick are placed in large kilns for burning which requires from five to nine days. The kiln furnaces are carried at a very high temperature during the final period of burning, ranging from twenty-seven to twenty-nine hundred degrees Fahrenheit to obtain complete and thorough expansion of the brick. This requires in all a period of about twenty-one days from the time the raw material enters the process until the finished brick are ready for shipment. The resultant composition of a first quality silica-brick is ninety-six per cent refractory silica, two per cent calcium oxide (lime), and the remaining percentage of impurities as found originally in the rock.

The manufacture of silica-brick in the United States had its beginning in the year 1884, when the A. J. Haws & Sons' Company of Johnstown, Pennsylvania, produced the first silica-brick made from Ganister Rock shipped from McKee, Blair County, by Jesse L. Hartman. The next company to make silica-brick was the Harbison-Walker Company at Pittsburgh in 1886 from McKee Rock. Prior to 1884, the requirements for silica-brick were very small for the reason that the open-hearth process of making steel was in its infancy. Not until many years later did it come into prominence as a better method than the Bessemer Converter process of producing steel. One of the famous brands of silica-brick imported was the "Dynas Silica Brick" from Germany. The importations, as the records show, were very small and ceased entirely in the year 1889

when the two American plants, the Haws and Harbison-Walker, were able to take care of all requirements, manufacturing as they did silica-brick as good in quality as the imported.

The principal and most important industries in which silica-brick is the chief material used, are in the open-hearth process of making steel and in the bi-product coke ovens. In both these industries, the importance of which can scarcely be estimated, insofar as our present civilization is concerned, the products steel, coke, and coal tar, are produced. The many and varied uses of steel are well known and likewise coke. Coal tar, a bi-product, is recovered from the new coke oven process of the same name and merits mention here, in that the very great importance of coal tar as a base product is little known or understood. From coal tar alone, the synthetic chemist has succeeded in producing some of the most valuable and indispensable articles necessary almost for our very existence, in the complex life in which we live. The many thousands of medicines and a great many of them recognized and proven specifics, derived solely from coal tar, have been of incalculable benefit in wholly eradicating or controlling some of the most malignant and terrible diseases to which all mankind is heir. The resultant products from coal tar derivatives alone are so many and varied that one experiences nothing less than amazement when a perusal of the list is made.

Ganister Rock may well be considered one of our most imporant raw materials, making it possible through the medium of silica-brick, to construct and build steel furnaces and coke-ovens capable of withstanding the great wearing action and the extreme temperature which obtains in both processes.

Another important field and one in which the raw rock is used without first making into brick and burning, is the Bessemer process of making steel. Here the rock is ground and mixed with fire clay and the resultant plastic material used to line the steel converter. The consumption in the past has been very large, but due to the rapid replacement of the old Bessemer Converter process of making steel by the open-hearth, the requirements in past years have been much less than formerly.

The unprecedented development of the metallurgical industries in the United States, commencing about the year 1908, resulted in the manufacture of a great number of ferro alloys. Two processes require a certain amount of Ganister Rock to obtain the desired alloy, and in fact to make the manufacture of the alloy at all possible. Silica is found in a great variety of forms and compounds and widely distributed, but if its physical condition is not of the right form, it is useless for many purposes. An example is glass sand which is identical in analysis with Ganister Rock, but entirely unsuited for the processes and uses to which the rock is put because of the very fact that it is in the form of sand and is not refractory. One of these alloys is ferro-silicon, as manufactured by the Electric-Furnace process, wherein the rock and steel are chemically combined by subjection to the temperatures obtainable in the electric furnace variously estimated at over six thousand degrees Fahrenheit. This high temperature in connection with the use of coke breaks down the silica rock and permits its complete fusion with the steel. The percentage of mix may be fifty per cent rock and fifty per cent steel or a mixture ranging from twenty-five per cent steel to seventy-five of rock. This resultant ferro-silicon alloy serves an important requirement in the open-hearth process in the capacity of a cleanser for the bath of molten steel, and by the introduction of a small amount of this cleanser the charge is hastened and the finished steel is obtained more quickly. Many thousands of tons of ferro-silicon were used by the allied armies in the World War for generating free hydrogen. The United States Government requisitioned for this purpose a mixure of 82½ per cent Ganister Rock with 17½ per cent steel. This proportion was very hard to produce and only one company, the Electro Metallurgical, of Niagara Falls, N. Y., successfully manufactured the material, all the Ganister Rock for which was furnished by the J. L. Hartman Company.

Still another important alloy, is silicon metal, the largest percentage of which is composed of Ganister Rock. This silicon metal when alloyed with aluminum increases the strength of the metal aluminum many times without destroying to any appreciable extent its chief characteristic, lightness of weight.

Lime in the Treatment of Trade Wastes

By E. B. Besselievre, Sanitary Engineer, The Dorr Company.*

CLEAN, palatable water is a necessity of man for his normal existence and for his domestic animals. Abundant water is necessary to the productivity of most manufacturing plants. A very large percentage of the water consumed by man and industry is returned to the streams, but in a polluted condition, and the man or industry, downstream, receives this polluted water. If discomfort, disease and damage are to be prevented, measures must be taken to prevent this pollution.

Filtration plants installed by the water user will protect him but will also place upon him the burden of treatment of another's waste. Natural laws of equity say that this burden should not be placed upon the innocent water consumer, but that the one who pollutes the water should do his part to protect his neighbor.

In this country, this principle has not always been enforced, but now, all of the forty-eight states of the Union have active health departments. One of the most important duties of these health agencies is to conserve health and property by preventing the pollution of streams. Concerted action by manufacturer and the State is required to accomplish this, but ofttimes considerable pressure must be brought to bear before any definite move can be taken or is taken. The manufacturer producing a liquid waste which contains polluting matter is naturally reluctant to install a plant to render these wastes innocuous, because in many cases he cannot hope to recover any profitable substances and his expense of treatment will be a daily financial load.

Most industrial wastes can be rendered harmless by modern methods of treatment, but some of the more complex combinations need careful study to devise the most economical form of treatment. The polluting elements in industrial wastes are either organic, chemical, or mineral, and cause trouble by rendering the water distasteful or harmful to the human system, or to the machinery and processes of the manufacturing plant. As profitable operation of an industrial waste treatment plant can seldom be hoped for, it should be the object of every engineer engaged to investigate a problem, to determine the cheapest, most practical way to solve it.

Chemical treatment is, in most cases, necessary to produce water-white, neutral effluents from waste treatment plants. This being the case, the use of those chemicals that are cheapest, most easily procurable, and of local origin, not dangerous to handle and not poisonous, should be given careful consideration.

Lime meets all of these requirements. It is found in all parts of the country, is usually low in price and is easy to handle, and harmless. The writer's experience in handling a large number of industrial waste problems is that frequently tests of a particular waste will produce results by the use of a small amount of a certain chemical, perhaps a patented article procurable only from one source. Further test will frequently show that by using larger amounts of another, or perhaps two other chemicals the result will be the same and the cost less. Lime usually forms the one found cheapest or is in the combination. The Dorr Company in a large number of investigations of industrial wastes, extending over four years, has found over forty cases in which lime alone, or used in combination with another chemical, procured the desired results. Where acidity is to be removed, or solids precipitated, lime is usually the ideal agent. After formation of floc by other agents, lime precipitates the floc. The sludge formed by lime precipitation is usually inodorous and may be filtered or otherwise dewatered to a state where it can be readily disposed of.

It is impossible in a brief article of this nature to cover all the possible reactions and uses of lime, and the writer's intention is to present a short resume of the actual types of industrial wastes that have been successfully treated by the use of lime and to describe very briefly a few operating plants using lime for treating industrial wastes.

In investigating the industrial waste problems presented to us, we have found the following industries to have wastes which respond to lime treatment; rubber reclaiming plants, tanneries, textile mills, including

*A paper presented at the Seventh Annual Convention of the National Lime Association, May 26, 27, 28, 29, 1925.

bleacheries, dye houses, wool scouring plants, finishing works, piece-dye plants, etc., distilleries, laundries, cocoanut products, strawboard, paper mills, gun wadding, roofing paper, banana oil, gas house, creameries, canneries, packing houses, steel and iron mills, sugar factories, etc.

Textile mills produce usually a highly colored, highly alkaline or acid waste. Lime serves a great purpose here in precipitation and neutralization, helping to render the sludge easier to handle, and by rendering the organic solids stable. Piece-dye works' wastes and woolen mill wastes are the most difficult textile wastes to treat, the former because of the constant change in character and color, and the latter on account of the wool grease itself. Tannery wastes contain finely divided solids, which without assistance, settle slowly and also color and tannic acid. Lime is an ideal aid in treating these wastes, to precipitate and neutralize.

Creamery wastes contain a large amount of highly putrescible solids and casein. By adding ferrous sulphate and lime, the solids and casein are coagulated and precipitated and a clear, fairly stable effluent produced. Several plants of this type have been in successful operation for several years. Cannery wastes, from vegetable canneries in particular, contain large volumes of solids and are readily putrescible. Lime acts as a precipitant and also as a disinfectant, preventing the decomposition of the solids. Plants treating pea and tomato wastes by the use of lime and ferrous sulphate, are in successful operation.

Coal-mine wastes are usually highly acid and where these discharge into clear streams, the wastes may be readily neutralized by the use of lime. Wastes from steel and iron mills, known as "Pickling liquors" are highly acid, and lime again acts as the neutralizer.

Lime usually produces a voluminous sludge and the disposal of this is a problem in itself. The wetter this sludge, the greater is its volume, so that any unit which will reduce the moisture will be a decided advantage to plants using lime. Using lime as a precipitant requires the use of a sedimentation tank to allow sufficient time for the position of the precipitating solids. If this sludge is allowed to accumulate on the bottom of the tank, it will, after a short time, be necessary to shut the tank down and clean it out. While this is being done, another tank must be available or the treatment stopped.

To enable continuous treatment to go on, to eliminate the need for duplicate tanks, to eliminate manual cleaning of sedimentation units, and to assure uniform results in clarification, by keeping the volume of the tank always the same, a unit known as the Dorr Clarifier has been in successful operation for several years. This unit is a simple, square, concrete, sedimentation tank with a slightly sloping bottom, equipped with a mechanism which revolves very slowly and continuously collects the sludge and carries it to a common point for removal from the tank. In moving the sludge to the point of discharge, the mechanism squeezes and rolls it, and consequently delivers to the pump a sludge of substantially less moisture than could be procured otherwise. This unit requires a very small amount of power to run it, and practically no manual attention.

The feeding of lime to the waste to be treated is important. The writer believes the use of powdered, hydrated lime is the easiest and most practical way as the difficulties encountered are less and manual attention required is less. There are several good dry feed units on the market, but the writer's with the actual feeding mechanism experience is that the difficulty most encountered in feeding dry lime is not but is in the hopper. Lime, when any moisture is present, tends to form an arch at the mouth of the feeder and when this happens, no lime gets to the feeding device. Feeder manufacturers should give this point careful study and should devise means to prevent arching in the hopper.

Of all available chemicals that have a practical value in the treatment of industrial wastes, and at the same time possess the elements of economy, easy procurement and easy handling, lime stands preeminent, and no one investigating such problems can neglect its possibilities.

Lime in Water Purification

The Bureau of Standards has issued circular No. 231, containing recommended specifications for quick lime and hydrated lime for use in the purification of water. This publication can be secured from the Superintendent of Documents, Government Printing Office, Washington, D. C., at five cents per copy.

Blasting Practice in Quarry And Open Pit Mining

Written Expressly for Pit and Quarry, By R. N. Van Winkle

Part V.

This is the fifth of a series of six articles. The first appeared in the June first number of Pit and Quarry. In the first article Mr. Van Winkle discussed the action of explosives, kinds of explosives, selection of explosives and amount of explosives to use.

In the second article, which appeared in the June 15th number, the size of cartridges, explosive costs, and methods of figuring the shot were discussed.

In Part III drilling, locating and loading practice as applied to quarry and open pit mining were discussed.

In Part IV firing practice, the tunnel method and the benching method of blasting were discussed.

Readers are invited to correspond with Mr. Van Winkle in relation to these articles or to blasting problems in general. The editor of Pit and Quarry will be pleased to receive comments or data on this subject from readers whose experience and knowledge will be of value in the study of blasting practice.

Editor.

Accessories

There are many facts concerning the handling and use of explosives or blasting accessories that are of value to anyone who has anything to do with the purchasing, storage, handling or use of them. Users of explosives and explosive accessories are far too ready to blame any irregularity in the results or lack of results obtained upon the explosives or the explosive accessories when, in fact, mishandling or misuse or lack of knowledge or precaution was the fault. Explosives and explosive accessories are manufactured, packed and shipped with the greatest care possible; inspectors, engineers and chemists of the highest type and qualifications are continually striving for the perfection and safety of commercial high explosives. Occasionally a shipment may be received which is defective or not up to the high standard ordinarily attained by the manufacturer, but as a rule in such a case only courtesy, prompt action and efficient service are accorded to the customer if the manufacturer is advised of the condition.

Safety Fuse

Safety fuse, of which there are many brands, carry trade names such as Beaver, Clover and Anchor, and are further classified as hemp, cotton, single, double and triple taped. They are classified still further as to their water resisting properties and speed of burning. Safety fuse is made that will burn within limits of from 30 to 40 seconds per lineal foot in the open, depending upon the brand and manufacture. This speed of burning is subject to a variation of 10 per cent either way. The burning speed of fuse is ordinarily accelerated when placed in holes with tamping around it, depending upon the fineness of the tamping material and the firmness of the tamping. While safety fuse is made with two kinds of fuse powder core, free and solid, solid core fuse or that fuse where the powder is made in a semi-solid mass clinging to the thread or adjacent yarn, is about the only fuse in ordinary use today. It is better adapted to practically all kinds of work due to the fact that when the fuse it cut, the powder will not run out as is the case with the free core fuse. There is no regulation or law prohibiting the shipping of safety fuse via parcel post, provided it is packed in a strong and tight container and plainly marked, "Safety Fuse." Ordinary brands of hemp and cotton fuse are too small in diameter to fit the standard blasting cap properly and should therefore not be purchased or used in conjunction with blasting caps. Safety fuse should never be cut on a slant, but it should be cut straight across with a clean sharp blade. Ordinarily fuse is cut with a knife of some sort, tinners snippers or cap crimper. A draw knife properly mounted on a board a picture of which is shown, affords an easy and efficient way of cutting fuse, as the blade of the draw knife can be sharpened when necessary.

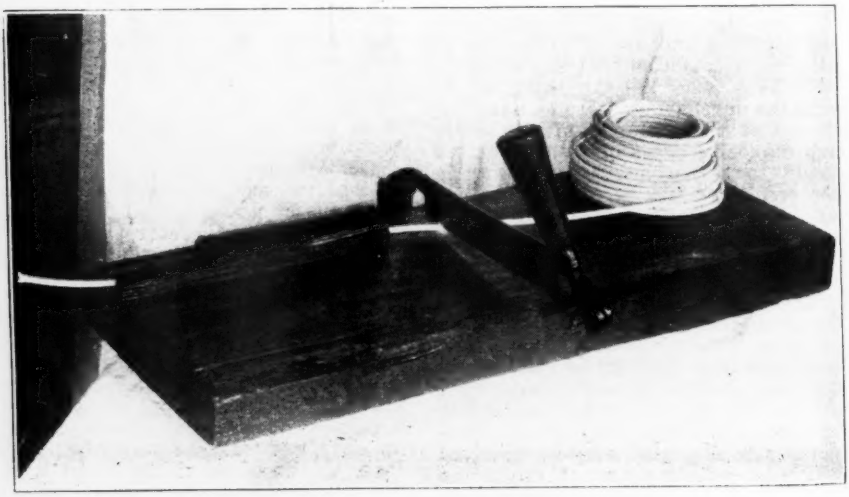
In the storage of safety fuse it is bad practice to store it in a place that

is too hot, as the fuse will dry out and crack when uncoiled. Fuse will also crack if uncoiled when it is too cold. If possible fuse should be stored in a dry place where the temperature is around 70 degrees Fahrenheit.

Attempting to waterproof safety fuse with grease in any form is bad policy as the oil in the grease will penetrate and dampen the powder train. Safety fuse can always be tested in the field by observing its condition and trying out a foot or two of it from a coil or case.

Cordeau

Cordeau, or Cordeau-Bickford, is sometimes referred to as a detonating fuse and is patented. It is a lead tube about the diameter of double taped safety fuse and is made in plain, countered and double countered forms. The countering or outside cotton covering tends to strengthen it and furthermore protects it from abrasions or breaks in jagged holes and from tamping material and tamping operations. Cordeau is practically insensitive, and there is absolutely no danger in handling, storage or shipping, as it cannot be set off by friction, fire or any ordinary shock. It requires a blasting cap or an electric blasting exploder properly attached to detonate it. When detonated it has a speed of approximately 17,500 feet per second, which speed will not diminish. In addition to the advantages to be gained from detonating the explosive charge instantaneously throughout its entire length, with Cordeau there is doubtless more thorough detonation due to the fact that it is more powerful than a cap. When explosive charges are not continuous, but are placed at different points along the bore or drill hole, separated by stemming, Cordeau furnishes a convenient and efficient means of continuous detonation. There are cases where electric exploders are not practical owing to the fact that the number of holes to be fired at one time is greater than the electric current available. In such cases Cordeau can be used to great advantage as the number of holes that can be set off together is practically unlimited. It is also used in conjunction with electric blasting caps in the tunnel method of blasting, as electric wires can be carried to each pocket and the electric exploder attached to a length of Cordeau which in turn is coiled around in the explosive charge. There are many places where Cordeau can be used advantageously in open pit and tunnel operations, and the manufacturers are always ready and willing to furnish a competent demonstrator to assist in teaching use of Cordeau. Special accessories such as brass couplings, straight unions to be used in conjunction with blasting caps, special unions to be used in conjunction with electric blasting caps and



Device For Cutting Fuse

slitters should invariably be used with Cordeau. It is also advisable in ordering Cordeau to specify the lengths required for drill or bore holes so that spools of it can be shipped containing lengths which will cut with minimum waste. It will increase the speed and efficiency of the less sensitive explosives, such as ammonias, gelatins and starches, but it fails to increase the efficiency of straight dynamite. Therefore no advantage is gained in running Cordeau throughout the entire length of the charge where the charge is composed of extremely high per cent gelatins or straight dynamites where the normal speed of the explosive itself is faster than Cordeau. However, a small piece of Cordeau is sometimes used in connection with the priming cartridge as a booster with straight dynamite and extremely high per cent gelatin dynamites. In wet work the submerged end of Cordeau should be made water tight by closing the end securely, and all joints should be protected from friction with rubber tape. Always arrange the main line of Cordeau in bank shooting so that the detonating wave reaches the row of holes next to the face first and then the other holes as they recede from the face. It is seen from the above that Cordeau can be used not only as a detonating fuse but also as a booster or accelerator.

Galvanometer

A galvanometer is an instrument used for testing individual electric blasting caps and for testing circuits in blasting operations to find out whether they are closed or open. In using a galvanometer one should test it first by the placing of a short piece of copper wire across its two binding posts. As this wire has almost no resistance, the needle should be reflected to its widest limit. Should this not occur, the battery cell is exhausted or weakened and should be replaced. While the galvanometer is simple in design and construction, it is of necessity delicate and should be handled carefully and kept dry. For the testing of a circuit, if the circuit is perfect, the needle will move across the scale, but if the needle does not move, or does not move as far as it should, there is a break in the circuit. About the only thing to wear out is the battery, and the battery of a galvanometer, when properly used, will make several thousand tests. When exhausted it should be promptly replaced, otherwise the instrument is useless. The electric current which is sent through an electric detonator or electric exploder when making a test with a galvanometer is less than 1/10 of the strength required to explode it.

Blasting Batteries

Everyone who has had any experience with electric blasting is more or less familiar with the blasting battery. The blasting battery is essentially a dynamo. When the handle or rack bar is pushed down vigorously, a current is generated by the revolution of the armature and the current accumulates until the end of the stroke is reached, at which point, the rack bar pressing down the contact spring, the circuit through the magneto is broken and the current is discharged through the posts at the top. Many misfires and faults are blamed upon a blasting battery, when if the battery is properly oiled and not thrown about or permitted to remain exposed to wet weather and is stored in a dry, warm place, little trouble will be experienced. The copper brushes should be kept clean and should bear firmly on the commutator; the circuit breaking contacts should be kept clean and bright. While blasting batteries have played an important part in shooting operations in the past, power and lighting circuits are constantly supplanting this method of generating current. They are a handy thing to have around, however, and there are places where their use can be highly recommended.

Blasting Caps

A blasting cap is a copper cylinder containing an explosive charge which is open at one end to permit the inserting of fuse for firing. Blasting caps are used exclusively in connection with safety fuse. There are two sizes or strengths of blasting caps: Number 6, which are ordinarily put up in red boxes or are red labeled; and Number 8, which are packed or labeled in green boxes. It may be of interest to know that a Number 8 blasting cap contains exactly twice the charge of that contained in a Number 6 cap. All caps made in this country are satisfactory detonating agents when they are in good condition. Any of them that have not deteriorated,—and wet storage is responsible for practically all deterioration,—will detonate commercial high

explosives if the explosives are in good condition. The lead or aluminum plate test for field testing blasting caps is not always perfectly satisfactory, but field tests can be made by detonating the blasting caps with a fuse. If results are not satisfactory, or if there is any question as to the condition of the caps, it is best to call the matter to the attention of the manufacturer. A visual examination of blasting caps as to whether they look as if they had been subjected to moisture or the copper corroded is a fair way of checking up on the ages of blasting caps. It is important, when making complaints or when calling attention of the manufacturers to irregularities concerning blasting caps, to give the number of the box or case from which the caps were taken. In each tin box containing blasting caps will be found a packing ticket, and one will also be found in the case containing the tin boxes. reference information is very helpful to the manufacturer in tracing irregularities.

Electric Blasting Caps

Electric blasting caps, exploders or detonators resemble blasting caps except that they are larger in diameter and are longer. They are also made of a copper cylinder containing powerful explosives, but are closed at both ends and sealed into one end are two wires. To illustrate the delicate construction of the electric blasting caps and the reasons they should be handled carefully, a sketch is given showing the cross section of a typical electric blasting cap.

"A" is a copper shell having a corrugation thrown out from the inside which holds the filling material more firmly in place. "B" is the chamber containing the explosive charge. "C" are the insulated wires entering the cap. "D" are the bare ends of the copper wires projecting through the plug into the charge. "E" is the small wire or "bridge" soldered to and connecting the two ends of the copper wires, which is heated by the electric current. "F" is the composition plug holding wires firmly in place. "G" is the filling and water proofing material.

It can be seen by looking at the sketch that the wires and caps should be handled with extreme care and that the wires should not be kinked or bent sharply as they may break or throw the bridge out of adjustment and ruin the cap. There are two kinds of electric blasting caps; one known as the electric blasting caps, which are practically instantaneous, and the other as delay electric blasting caps. It is good policy when using either kind to use only copper wire on account of the low resistance. Electric blasting caps with iron wires are sometimes used in mining on account of their cheapness, but the resistance to electric current in iron wire is about six times as great as where copper wires are used. Electric blasting caps are also made which are water proof, and are therefore recommended for extreme water conditions. For blasting with electricity in wet work, water proof electric blasting caps are unquestionably best suited; however, if it is impossible to procure them and it is necessary to make a shot or blast immediately, a suggestion is to cover carefully and thoroughly the electric blasting cap shell and wires with thick grease, soap or dip them entirely into quick drying asphalt paint for the purpose of water proofing them. As with blasting caps the lead or aluminum plate test for field testing is not always satisfactory, but a visual inspection in the field can be made of electric blasting caps by noting their condition. Particular inspection should be made of the ends of the caps in which the wires are inserted to see that the water proofing material is not broken and that the wires are not loose in the water proofing material. Misfires caused by electric blasting caps or exploders are extremely rare when one considers the millions of them that are sold and used annually. If there is any question as to the condition of electric blasting caps, it is best to take the question up with the manufacturers, saving as in the case of blasting caps the loading or inspection ticket for reference. Electric blasting caps are also made in two sizes. Number 6 and Number 8. While the writer has seen electric blasting caps used in conjunction with dobv or block hole shooting, it appears that it is too expensive a practice to be followed and that blasting caps and fuse will suffice under most conditions. In the use of electric blasting caps one wire should be cut somewhat shorter than the other so that the splices or making of joints, if necessary, will not come opposite to each other, this being a safeguard against short circuits.

Laws Having To Do With Explosives

Often in case of an emergency one is tempted, rather than to close down operations, to carry a small quantity of blasting caps or electric exploders on a train or public conveyance. It will be well to consider the law on this subject. The Federal Statute covering "The Carriage of Explosives with Passengers, May 30, 1908" is as follows:

"It shall be unlawful to transport, carry, or convey, within the limits of jurisdiction of the United States, any high explosives, such as, and including dynamite, blasting caps, detonating fuses, black powder, gun powder, or other like explosives, on any vessel, car or vehicle of any description operated in the transportation of passengers by a common carrier engaged in interstate foreign commerce, which vessel, car or vehicle is carrying passengers for hire: Provided, That, it shall be lawful to transport on any such vessel, car or vehicle smokeless powders, primers, fuses, not including detonating fuses, fire works, or other similar explosives, and properly packed and marked samples of explosives for laboratory examinations not exceeding a net weight of ½ pound each, and not exceeding 20 samples at one time in a single vessel, car or vehicle which is being used for the transportation of passengers for hire. The words, "Detonating Fuses," as used in this section shall be interpreted to mean fuses used in naval or military service to detonate the high explosive bursting charges of projectiles, mines, bombs or torpedoes. The word, "Fuses," as used herein shall be interpreted to mean the slow burning used commercially and intended to convey fire to an explosive or combustible mass slowly or without danger to the person lighting."

Any violation of the above Statute carries a fine of not more than $2000 or imprisonment for not over 18 months or both. The Federal Statute covering "Death or Injury Caused by Such Transportation, March 4th, 1909," is as follows:

"When death or bodily injury of any person is caused by the explosion of any article named in the section preceding, while the same is being placed upon any vessel or vehicle to be transported in violation thereof, or while the same is being transported, or while the same is being removed from such vessel or vehicle, the person knowingly placing or aiding or permitting the placing of such articles upon any vessel or vehicle, to be transported, shall be imprisoned not more than 10 years."

Records

Records or data of both drilling and blasting operations are valuable as-

Detailed Loading Sheet Used at Open-Pit Mine in Arizona

Hole No.	Ht. of Bank	Depth Hole	Bottom		Deck Loading				Stemming	Total
			Lbs.	Depth	Lbs.	Depth	Lbs.	Depth	Ft.	Lbs. Exp.
1										
2										
3										
10										
11										
12										

Shooting Record

Date	Place	Lbs. Powder Used	Exploders Used	Total Ft. Drilling Used	Total Tons Stone Shot	Tons Shot Per Foot Drilling	Tons Shot Per Lb. Powder	Cost per Ton Shot	Remarks

sets, being interesting and instructive. If properly used, they are guides to efficient and economical blasting. Previous mention was made to the keeping of a log or record on each well drill hole, which record can be used to advantage when loading the hole with explosives. A reliable record of explosives put in each hole and where loaded as to location in the hole will be found to be of great value. The form given below, which is used by one of the large mines in Arizona, will serve as a guide for making forms for such records.

It is, moreover, good policy to keep a tabulated record of every sizable shot made, as the information so gathered will prove valuable in making future shots. As a guide for a form for keeping this data, there is shown below a copy of the form used by the writer.

The keeping of records is a tedious operation, and it is advisable to use as simple a form as possible. The forms given here will not fit all conditions but can be modified to be suitable for varying conditions.

Railroad Regulations Concerning Explosives

We note the following from, "Storage Rules and Charges" published by the American Railway Association, B. J. Jones, Agent, Traffic Bureau, Freight Tariff No. 1-E, covering the storage and charges to be made for storage on high explosives and accessories as used in the quarry and open pit mining industry.

Under the tariff regulating the above, explosives and accessories are classified under two headings.

Section "A" More Dangerous Explosives:

Black powder, blasting caps, electric blasting caps, high explosives and low explosives.

Section "B" Less Dangerous and Relatively Safe Explosives:

Cordeau detonant, delay electric igniters, electric squibs, fuse lighters, instantaneous fuses, percussion caps, percussion fuses; safety squibs and time fuses.

Extracts from regulations prescribed by the Interstate Commerce Commission:

1 Paragraph 30 (B)—"Consignee must remove shipments of dangerous articles from the carrier's property within 48 hours after notice of arrival at destination, Sundays and holidays not included. If explosives are not removed, shipments may be immediately disposed of (1) by storage at the expense of the owner, (2) by return to the shipper, if reasonably safe storage is not available, (3) by sale, or (4) when necessary to safety by destruction under supervision of a competent person.

When shipments of explosives and other dangerous articles are not removed from the railway premises by the consignee within the legal limit, (48 hours) (2 days), after the first 7:00 A. M. following notice of arrival, the most practical of the steps authorized in paragraph 30 (B) as quoted above must be taken to secure the removal.

Storage Rates are as Follows

More Dangerous Explosives Covered In Section "A". On less than carload shipments a 28½ cents per hundred pounds with a minimum charge of 50 cents for shipment. A charge of $5.00 per day in addition to the regular demurrage and track storage charges will apply on shipments held in cars for or by consignor or consignee, for loading, unloading, forwarding directions or for any other purpose.

Less Dangerous and Relatively Safe Explosives as Covered in Section "B". On less than carload shipments 8 cents per hundred pounds per day with a minimum charge of 25 cents for shipment. A charge of $2.00 per day in addition to the regular demurrage and track storage charges will apply on shipments held in cars for or by consignors or consignees, for loading, unloading, forwarding directions or for any other purpose.

Bucyrus Opens Pittsburgh Office

The Bucyrus Company, South Milwaukee, Wisconsin, announces the opening of a sales office at 461 Union Trust Building, Pittsburgh, Pennsylvania, in charge of Mr. A. R. Hance, formerly Northwestern Sales Manager of the Bucyrus Company. Mr. Hance will handle the sale of Bucyrus equipment in Ohio, western New York, western Pennsylvania, western Maryland, West Virginia and eastern Kentucky. Mr. Hance will be assisted by Mr. F. B. Smith, who is already well known in this territory.

Factors Governing Modern Lime Kiln Capacity and Fuel Economy

By Victor J. Azbe, Consulting Combustion Engineer

Part V.

Part I of this paper appeared in the June first number of Pit and Quarry. Actual fuel lime ratios, heat distribution in theoretical kilns and kiln efficiency rating were discussed.

In Part II, which appeared in the June 15th number, effects of excess air on lime kiln efficiency, incomplete combustion, and heat loss by radiation were discussed.

In Part III, published in the July 1st number, kiln performance was discussed from gas analysis, and the results of kiln gas analysis tests were presented and discussed.

In Part IV, which appeared in the July 15th number, the reduction of kiln efficiency during the drawing period, the lime kiln as a heat transfer apparatus, kiln capacity, rating, proper kiln proportion and operation were discussed.

This paper was prepared by Mr. Azbe for the Seventh Annual Convention of the National Lime Association held at Briarcliff Manor, New York, May 26, 27, 28 and 29, 1925. The sixth and last part will appear in the next number of Pit and Quarry.

Editor.

That operation is an important factor is proved by Figure 14, where output variation of a plant operating the same number of kilns all the time is ven. The variation from week to week at times is as great as 25 per cent. In this case, it is all due to the fact that the design is not such as to facilitate proper operation; the stone has nothing to do with it.

To obtain the proper output for a given cubical kiln space, the kiln should be operated efficiently; radiation loss must be low; excess air must be low also. The kiln should be tight, and air should enter only where there is fuel to burn.

The eyes should be as large as are practically permitted so that the flame can enter freely into the kiln. For best results there should be a small amount of gas pressure in the eyes. In any case, there should be no draft. If there is no draft, it indicates that all of the kiln draft is used up in friction of hot gas passing up through the kiln. If there is draft, it indicates, on the other hand, that the kiln can handle more gas. This means that more coal can be burned and more lime made.

For maximum output the kiln top should be closed, and the kiln equipped with some draft producing equipment, but this must be used very carefully. Even with induced draft on top, no draft is allowable at the kiln eyes. The mechanical draft on the kiln top is for the purpose of moving gases through the kiln only and not to produce draft to draw air or gas into the kiln as it is employed at times. If these conditions are satisfied and the kiln cross section in relation to the height is right, and the stone size is within reason, good capacity and good fuel efficiency will be the result.

Method of Firing, Oil, Gas, Stoker, Direct

The disadvantages of direct hand firing are numerous, most of them being accounted for by irregularity of heat emission due to volatile matter. Since air passing through the incandescent fuel bed is satisfied with carbon before it reaches the zone where volatile matter is emitted, and since volatile matter is almost all driven off from the coal in a very short period between two firings and must be burned by air admitted above the fuel bed, and since air admitted into the furnace above the fuel bed is actually less during the time the volatile portion of the coal is being gasified, due to volatile matter gas volume reducing the draft, it appears that the desirable regularity is quite impossible. When most air is wanted, least air will be obtained, so the fluctuation will be from loss due to excess air to loss due to incomplete combustion. If one of these losses is less, the other will predominate. To fire often and light helps little if any, at least in the case illustrated by Figure 10. The firing was in 15 minute periods, and incomplete combustion was worse than in any other case encountered. Frequent firing to be of real value must

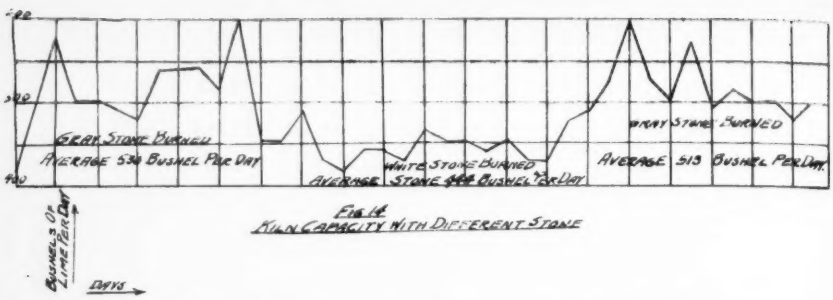


FIG 14
KILN CAPACITY WITH DIFFERENT STONE

be much more frequent, once every minute or so, and this is not practical by hand. While hand firing of kilns can be improved in most cases, with kiln capacity and fuel efficiency becoming better, the possibility for improvement is limited.

A better method is that of gas producer firing. The objection is increased investment; and if the producer is not operated right and the installation is not right, the fuel ratios will be no better with gas producers than they are in the case of direct firing. Gas producers can be divided into individual kiln producers, hand fired and hand punched; and into central gas plant producer in which case the producer as a rule is automatically fired, agitated and often ash removal is automatic also.

The main advantage of the first type, that of the individual hand stoked producer, is that it is right up against the kiln, and the heat loss by radiation from gas ducts is very small. This is a very important advantage. If these type producers are large, so that gasification per square foot of grate area is small and the coal is good and uniform, and the producer is located so that its own flue acts as a stack, then these producers can be operated without steam and make as good a gas as can be desired. In a certain plant, the writer tested the gas, and before, as well as immediately after firing, the CO_2 was 4 per cent and the CO was 27 per cent, which is very good when firings are as far apart as 30 minutes. The reason for this was slow gasification and low producer temperatures and consequent slow evolution of volatile matter. The objection to this type of producer, even under the best conditions, is that the cheaper non-uniform screenings cannot be burned satisfactorily and so better fuel at higher cost per heat unit has to be used. Then more labor is required for firing, coal handling, removal of ashes, etc. Next, more space is taken up and more carbon in ash, and irregularity is bound to occur when a large number of units have to be controlled.

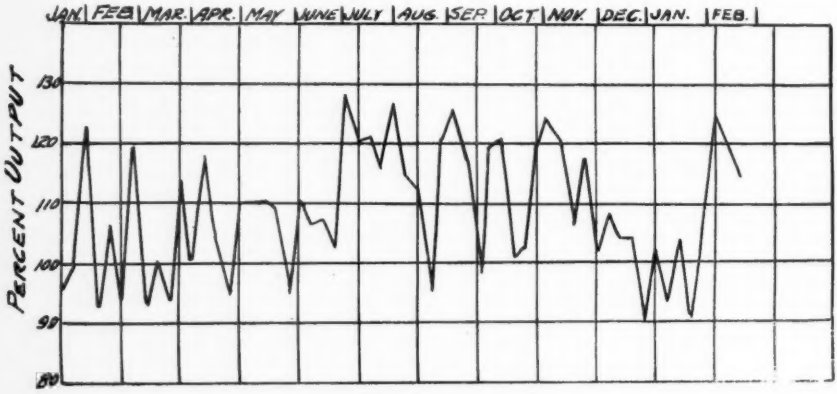


FIG 15.
WEEKLY LIME PRODUCTION

If this type of producer is too small or improperly installed, or if coal is such that steam has to be resorted to, then misuse is liable to become very great. In many cases, the so-called "producer" is more of a dutch oven than a producer. In a certain case on a test, the gas temperature leaving the producer fluctuated between 1725 degrees and 1860 degrees Fahrenheit. The CO_2 in the gas ranged from 8 per cent at the lowest to 14 per cent; the CO never was above 18 per cent, and at times was as low as 9 per cent. These are most unsatisfactory producer conditions especially since large volumes of steam were used for which coal in the boiler furnace was required and that same steam caused further harm in the kiln.

The advantages of the full automatic producer, if it is handled right, are quite numerous. It requires less space, due to its possible centralized location; less labor, due to its automatic features and the possibility of handling coal from car to bunker by means of conveyors. It will burn lower grades, cheaper coals, satisfactorily, and will give uniform gas at a definite pressure. The main objection is heat loss by radiation from extensive, large flues, but that can be minimized by proper internal insulation. How serious this loss by radiation can be was pointed out in the section on, "Heat Loss by Radiation," of this article. It can also be abused by using too large quantities of steam, practically to the point where it has little advantages over hand firing.

In regard to use of steam in gas producers, it has several objections. First, steam, especially large amounts of steam, means that most of the heat in the gas will be in the form of hydrogen. This means that the flame will be relatively short and intense, hard on lime and hard on brick. It will also lack luminosity. Then this hydrogen will burn to water vapor, and the capacity of water vapor to carry heat from the burning zone, where it can be used for lime burning, over into the preheating zone, where it cannot be used for this purpose, is very great, twice as great as that of air. Then, as was mentioned before, coal is required to make steam, and the boiler is usually inefficient as considerable coal may be needed.

In a certain plant the steam was substituted by CO_2 gas from the lime kiln top. The improvement was so immediate and so great that everybody was surprised. It was far beyond any theoretical predictions. The ratio in one month with CO_2 gas was over a pound of lime more per pound of relatively low grade coal than in the previous month with steam. In addition, the kiln capacity was increased. I fail to see where steam in a lime kiln can be beneficial. In practice I never encountered a case where good results could be definitely charged up to steam; in fact, the contrary is usually the case. I do not even see any theoretical reasons why it should be desirable, and certainly there are several theoretical reasons why steam is not desirable. The only benefit there is to it, is that it will keep fuel bed temperatures down, but even for that CO_2 is preferable and cheaper.

Of course, to use steam is simpler, so where the coal is good so that producers can be operated with only small amounts of steam, steam may become preferable; but with clinker-steam, CO_2 should be used instead.

Another promising method of firing lime kilns is the automatic stoker method. It was tried a number of times, but to my knowledge never with full success. During two distinct trials I had an opportunity to observe conditions, and I am sure that the method could gradually be evolved to satisfaction. Automatic stokers are, of course, a success in boiler plants, but to make them a success in lime plants, certain basic facts must be adhered to that apply in the lime plant only.

The requirements of enconomical stoker operation from boiler standpoint are not nearly as rigid. The ideal in boiler plants is 14 per cent CO_2, 4½ to 5 per cent oxygen and no carbon monoxide. Further, more oxygen than this does not cause very great harm. In a good lime plant products of combustion must not contain more than one per cent oxygen or carbon monoxide for heat results.

In view of the above, the kiln stoker fire must be better than boiler stoker fire and this with less attention. The stoker should be such that it will operate without being too greatly inclined to develop holes in the fire through which excess air will enter. The fuel bed itself should be definite; the ash should travel where the ash belongs. It should not hang up in the bed and develop clinkers at improper points. The cleaning should

be made convenient, and the kiln should be such that lime could be punched through other openings and not by working with the bar over the hot fuel bed through the furnace eyes. Then the lime kiln flame must be mild, luminous and long, a blow torch effect will not do at all. To get this, the rate of combustion should be low, that is, the stoker should be large, and the combustion space should be small and of such arrangement that the flame will enter the kiln with the least amount of agitation, or as direct as possible. If this is accomplished, the tendency to overburn the lime is eliminated, and the furnace will last the required length of time, which should be at least 10 months. To take a kiln down every few months is not practical. It may be that the underfeed principle is not the proper principle at all, and that an overfeed principle of burning coal is more suitable for lime kilns. Most trials were with stokers employing the underfeed principle which gives a much shorter flame.

The advantage of stoker firing with a proper stoker is that the flame enters the kiln without possibility of cooling as the case is with gas producers. Also, desired regularity is obtained, and volatile matter is properly taken care of which is impossible in the case of the direct hand fired method. Then again the kiln stoker in the final stage of evolution will burn cheaper grades of coal more satisfactorily than is possible by the hand firing methods.

Oil firing has even more advantages of regularity and reduction of radiation losses than stoker firing, but even oil firing for lime kilns is not so simple and fool-proof as it may appear. The most satisfactory system is a mechanical burner without steam. Steam will give too short and intense flame and will wear out the furnaces very rapidly. The efficiency with oil will be greater than with coal, but that is offset by the fact that in most localities oil costs a great deal more than coal. One should also not expect surprisingly good results with oil when the kiln is not proportioned right. In ordinary but good cases, a kiln efficiency of about 40 to 45 per cent is obtained which corresponds with an oil consumption of 45 gallons per ton of lime. When the burner adjustment is right, the lime from oil fired kilns will be better than coal fired; but when the burner is out of adjustment, it may be much worse. Oil firing, as well as any other method of firing lime kilns, is, however, still undeveloped, so these statements may with time have to be modified.

Edge Moore Waste Heat System

Waste Heat Recovery at the Hawkeye Portland Cement Co., (Des Moines, Ia.), with the Edge Moore Waste Heat System, is the title of a book just issued by the Edge Moore Iron Company, of Edge Moore, Del.

The book tells the story of how this company has increased the capacity of its plant from 3600 barrels per day to 4500 barrels, with the same kilns, an increase of 25 per cent, and this without increasing the amount of coal burned per barrel of clinker produced.

Prior to this installation the boilers burned 125 tons of coal per day and required a large working force, and in addition the maintenance costs were unusually high. The nature of the feed water was such that scale formed very rapidly and it was necessary to clean the boilers continuously, one at a time, on an average of once in four weeks. With one boiler always down for cleaning, the boiler room force found it difficult to meet steam requirements, and plant production was accordingly curtailed.

After careful study of conditions, Mr. Helmut Krarup, superintendent of the plant, recommended that a waste heat recovery system be installed. This proposal met with the approval of the general manager and the directors of the company, in view of the successful utilization of waste heat known to be secured in other wet process cement plants.

The installation of waste heat recovery equipment by this company was an important part of an extensive program of improvements designed to raise the quality and uniformity of the product and decrease operating expense. Part of the increased production is credited directly to the waste heat system, as the operators realize, they say, that the improved control of draft on the kilns made possible by the waste heat system enables more uniform operation of the kilns and consequently greater capacity.

Besides assisting materially to increase production, the Hawkeye Waste Heat system is credited with a large saving in the cost of power.

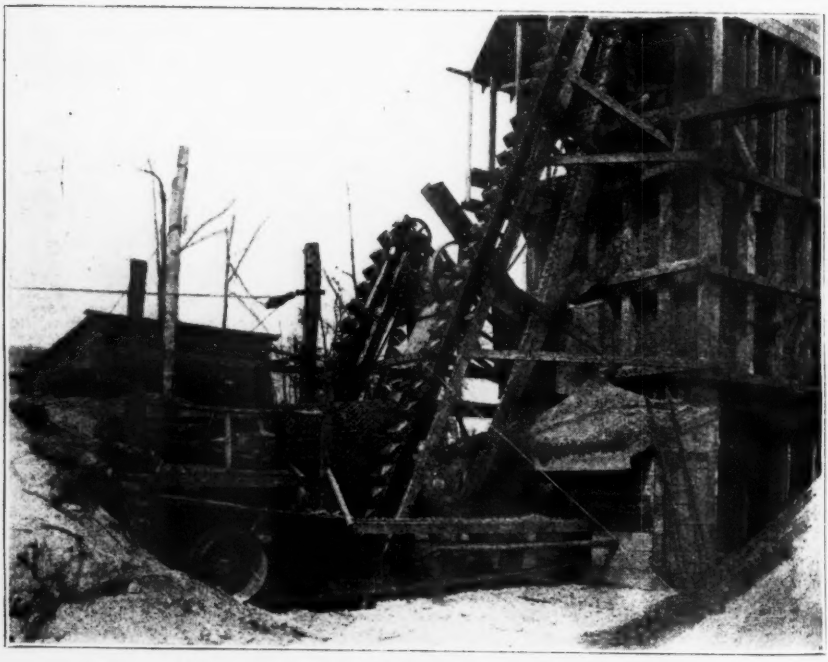
What's Wrong With This Plan?

BUSINESS balance is often absent from the small sand and gravel plant. If a plant is equipped with modern equipment and is returning a fair profit, there is usually satisfaction among the owners. There seems to be little thought given to broadening the market for the material produced or to engage in allied interests that would consume some of the material, such as the manufacture of concrete products and the building supply business. It is a significant fact that small producers in the sand and gravel industry prosper when there is no competition and local demands are good, and that these same producers fail or abandon operations because of too little profit when the local demand falls flat or competition enters the field. Failures in some pointed cases have been avoided by distributing the invested capital over allied interests and thus presenting a more active appearance which brings the interests more near the market source and tends to discourage new interests entering the field by virtue of the strong position secured in the local market.

The Ashland Sand and Gravel Company of Framingham, Massachusetts, serves to illustrate the practicability of such a plan. The president of this company is Mr. A. N. Leverone, who is also president of D. Leverone and Sons, Inc. The former company operates a sand and gravel plant producing 300 tons of material daily. The latter company consumes

Looking From Top of Bank Toward Plant

View of Crushing, Screening and Washing Plant



Close-Up Showing Scalping Screen and Crusher

practically all the material that was formerly waste in the manufacture of tile blocks. This latter company is also engaged in the building supply business handling lime, cement, coal, tile blocks and the material from its associated company, the Ashland Sand and Gravel Company. They are in touch with the architect, builder and contractor on each job. This broad contact affords an opportunity to develop a business upon service from several phases of every job. Incidentally they secure their cement for the tile block at dealer's prices and market their own sand and gravel without the dealer's charge. This small plant has established itself securely as a result of this plan. What is wrong with such a plan for other small plants, assuming, of course, that only a local business is desired and that requires only a small plant?

The Ashland Sand and Gravel Company produces its material from a 50 acre glacial deposit in Ashland a few miles from Framingham where practically all the material is marketed. A Sauerman ¾ yard Crescent power drag scraper operated by a Sauerman two speed special hoist brings the material in from the pit and dumps to a hopper of 20 cubic yards capacity. A Good Roads apron feeder at the bottom of this hopper feeds the material to an 18 foot bucket elevator that lifts the material to a chute which feeds directly into a Good Roads scalping screen. All material over 2½ inches is separated by this scalping screen and sent by a chute to a Climax 20x12 crusher. After crushing, the material is elevated to the scalping screen.

From the scalping screen the material is conveyed to the main screening and washing plant where it is separated and washed. The sand is first taken out by means of a short scrubber and dropped to a Good Roads wash box directly below. Water for washing is supplied by a 5 inch Goulds centrifugal pump driven by a 15 H.P. motor. The water which is constantly in motion takes out the fine sand. After the sand bin has been filled to capacity, the sand is diverted from the bin by turning the chute, which is on a swivel, so that the sand with a small amount of water flows down an inclined flume where a screen has been installed for producing brick and plaster sand. The sand drops through the screen to a storage pile. A Barber Greene loader is used in loading material from outside storage to trucks for delivery. Of the material produced 35 per cent is stone, from ½ to 2 inch, 60 per cent is sand and 5 per cent is roofing gravel. The plant is electrically operated throughout.

The officers of the Ashland Sand and Gravel Company include Mr. A. N. Leverone, president; Mr. E. A. Leverone, vice president; Mr. E. H. Ray, treasurer, and Mr. A. Belile, secretary.

Production of Natural Abrasives

The production in 1924 of the natural abrasives listed below was about 190,000 short tons, valued at nearly $4,000,000, as reported by the Department of the Interior from a statement prepared by the Geological Survey. In addition there were manufactured in 1924 more than 60,000 tons of artificial abrasives, valued at $6,213,740.

Natural abrasives produced and sold in the United States, 1923-24

Abrasive	1923 Short tons	1923 Value	1924 Short tons	1924 Value
Diatomaceous (infusorial) earth	65,833	$699,406	63,163	$693,917
Emery	2,286	29,478	2,195	19,756
Garnet	9,006	688,437	8,290	674,176
Grinding pebbles and tube-mill lining	4,551	51,795	2,532	37,429
Grindstones	37,384	1,008,899	28,991	852,260
Millstones	(a)	22,229	(a)	30,125
Oilstones, whetstones, hones, scythestones and rubbing stones	1,223	231,812	1,056	258,943
Quartz (abrasive) and feldspar	(b)	(b)	(b)	(b)
Pulpstones	9,186	680,416	9,193	814,409
Pumice	56,575	214,169	43,651	190,253
Tripoli	27,082	382,757	28,476	389,409
	.....	4,009,398	.....	3,960,677

a Quantity not reported.

b Quantity and value used for abrasives not collected separately by Geological Survey.

U. S. Gypsum Plant Addition

IMPORTANT additions are being made to two of the United States Gypsum Company's plants. At Staten Island, New York, an unusual construction is being carried on to provide additional rock-storage capacity, and a new specialty plant is being added to the property at Gypsum, Ohio.

Eight "skyscraper silos," the tallest of their diameter in the world, are being erected at the Staten Island factory by the General Contracting Company of New York City. The reinforced concrete tanks have walls 9 inches thick, 56 feet in diameter and 70 feet high, exclusive of the steel roofs and galleries that will surmount them. More than 10,000 barrels of Portland cement are being required for their erection and removable forms are being used which make it possible to pour concrete 24 hours a day.

This plant is the only one in the American gypsum industry for which the raw material is imported rock. Gypsum is brought down from Nova Scotia by a fleet of boats owned and operated by the United States Gypsum Company. Owing to peculiar conditions in the Bay of Fundy, navigation usually is closed four months each year. With the present tendency of the building industry to carry on operations throughout the winter, it is necessary to operate the plant at capacity all year in order to supply wall plaster to the Atlantic Coast states. With the increased demand made in those centers, additional rock-storage capacity has become necessary.

Each of the silos will contain 7,500 tons which, with present facilities, will make the total storage capacity at the mill in excess of 100,000 tons. This will provide material for capacity operation throughout the winter.

With this construction, all the rest of the receiving equipment on the property is being revised. Dockage is being repaired, brought out to the bulkhead-line, resurfaced with concrete and extended to a total length of 2,000 feet. One Maine Electric traveling Gantry crane with 2½-ton clamshell bucket is being installed now, and another one will be added in near future. This will make it possible to unload rock from the boats at the rate of 500 tons an hour which, in turn, will permit of more cargo-trips during the shipping season.

The silos are placed on a footing of piles. Over this, a solid block of reinforced concrete, 2 feet, 3 inches thick, has been laid, and the silos are being built above that.

Gypsum rock will be lifted from the boats by the Gantrys, which will deposit it on a 36-inch belt conveyor running parallel to the silos. After passing over a weightometer it will be elevated to the two receiving silos, situated nearest the plant. From the bottoms of these it will be withdrawn and conveyed mechanically to the crusher building, where it will be reduced in size and then passed over a set of Hummer screens. The fines will be used immediately. The lay-out is so arranged that the remaining rock may be processed at once or returned to the storage silos or to the old storage bins.

Rock intended for the storage silos will be elevated to a belt conveyor running the entire length of the silo-series, from which it will be discharged into the desired compartment. All the tanks will be roofed with steel so as to keep the material dry. Two units will be reserved for the white rock which is obtained in Canada from which specialties are made. The others will be filled with material for wall plaster.

This construction was started May 1. It is scheduled for completion September 1 and two months later the silos are expected to be filled with 60,000 tons of Canadian rock.

The addition to the plant at Gypsum, Ohio, is expected to be in full operation by August 1. It consists of a permanent fireproof building, 36 feet by 144 feet in dimension, its floor and foundation of Portland cement concrete, its frame of steel, its walls of Structolite (gypsum) concrete and its roof of Sheetrock-Pyrofill (monolithic gypsum) construction.

The best modern industrial practices in lighting, heating and ventilating have been incorporated, and the latest improved crushing, grinding, screening, mixing and packing machinery has been installed. This plant will manufacture four of the company's specialties—patching plaster, Sheetrock Finisher, a colored stucco-finish and a plastic paint for interior decoration which gives both texture and tone.

A Small Plant With the Right Idea

THE Luzerne Cement Products Company is successfully working a sand and gravel pit at West Nanticoke, Pa. The pit contains a very fine grade of free sand, lying in veins from 4 to 6 feet thick, with intermediate strata of a clayey sand.

The plant is taking out from 125 to 200 tons per day. The sand is excavated by a Finch Manufacturing Company scraper bucket of ¾ yard capacity. This bucket is operated by a two drum Lidgerwood electric hoist. This hoist is designed for use on small operations where an inexpensive, but economical and efficient machine is required. It is very simple in operation, being controlled by one lever, which throws one drum into friction and releases the brake, and at the same time pulls the otner drum out of friction and applies the brake slightly, just sufficient to prevent the rope from overhauling, or getting tangled at the end of the bucket run. This single lever therefore conveys, digs and dumps the bucket. The motor is 25 horse power.

The engine house is located at one side of the screen, the conveying and digging ropes running from the

Electric Hoist and Operator Who Has Full View of Operations

View of Pit Operated by Luzerne Cement Products Company

drums to and over the sheaves on a cross rail. The operator has the bucket in view at all times.

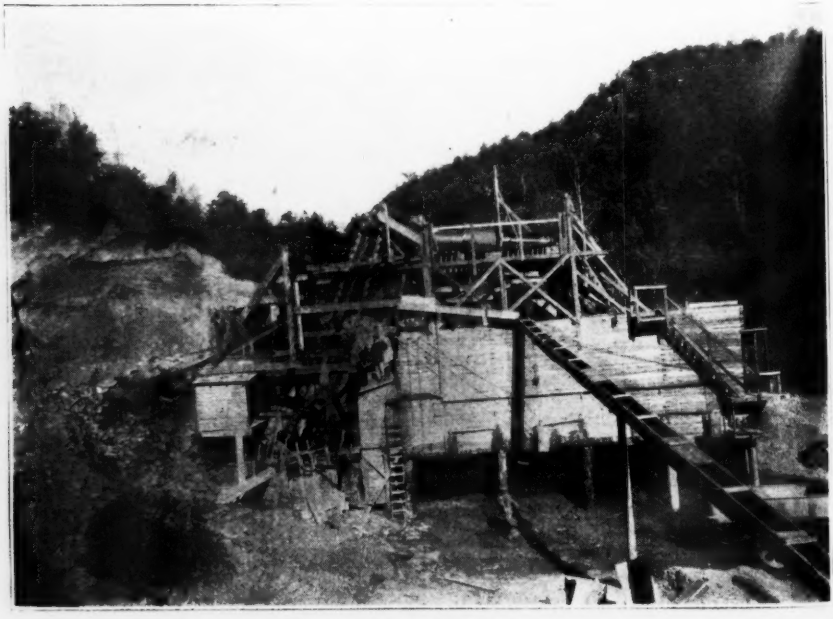
The bucket dumps the load on a rough screen, composed of track rails, which throws out the large stones. The rest runs over screens which pass everything under 1 inch into a pit, and everything over 1 inch is passed into the crusher which also discharges into the same pit. A bucket elevator takes material from the pit and elevates it to a battery of three screens, which grade ¼, ¾ and 1 inch. The sand is dropped into a washing tank, from which the clay is floated off through the sluice.

This plant has been in operation two years, and the results have been extremely good. It is a very efficient plant, and the installation cost is low.

One of the disadvantages of small operations is the effect of any change in market. This company has met this condition by operating a cement block plant in conjunction with the gravel plant. All surplus material is consumed in making blocks, and the capital invested in the gravel plant is thus distributed over a broader business. Not only has the cement block business consumed the surplus from the gravel plant, but it has been the means of developing a profitable business. The company has also been able to come into broader contact with the architect and contractor. In several instances the cost of blocks has been investigated before definite plans for building have been made. This had been a sales lead for gravel that probably would not have arisen otherwise. Would it help if a small producer through his block business should learn of a proposed building project? Would it be helpful to be able to pass such tips to the contractor? The Luzerne Cement Products Company has had experience that proves the answer to be yes.

Harvey Finch Passes On

The Sweet's Steel Company announce the death of their New York District Sales Manager, J. Harvey Finch, age 46 years. His death occurred in the French Hospital, New York, on July 2nd, and was the result of a ruptured blood vessel in the heart causing internal hemorrhages. Mr. Finch faithfully and efficiently served his company in the above capacity for the past ten years. Mr. Finch's successor will be announced by this company at a later date.



The Screening and Washing Plant

Portland Cement Output in June, 1925

Shipments of Portland cement during the month of June were the highest ever recorded in the United States for any month, according to statistics compiled by the Bureau of Mines, Department of Commerce. Production of this commodity also approached a record mark, the month's output having been exceeded only by that of May, 1925. Portland cement stocks show a seasonal decline, but are still at high levels, and are over 9 per cent greater than in June, 1924. The following tables, prepared by the Division of Mineral Resources and Statistics of the Bureau of Mines, are based mainly on the reports of producers of Portland cement. The June, 1925, totals include estimates for one plant.

Production, shipments, and stocks of finished Portland cement, by districts, in June, 1924 and 1925, and stocks in May, 1925, in barrels.

Commercial District	Production June		Shipments June		Stocks at end of June		Stocks at end of May,
	1924	1925	1924	1925	1924	1925	1925a
Eastern Pa., N. J. and Md.	3,301,000	3,554,000	3,945,000	4,340,000	3,521,000	3,321,000	4,106,000
New York	696,000	809,000	906,000	986,000	1,028,000	986,000	1,164,000
Ohio, Western Pa. and W. Va.	1,282,000	1,587,000	1,526,000	1,839,000	1,639,000	1,715,000	1,966,000
Michigan	899,000	1,140,000	1,093,000	1,320,000	571,000	1,065,000	1,245,000
Wis., Ill., Ind. and Ky.	2,044,000	2,441,000	2,209,000	2,553,000	2,356,000	3,106,000	3,218,000
Va., Tenn., Ala. and Ga.	939,000	1,176,000	956,000	1,369,000	753,000	418,000	611,000
Eastern Mo., Ia., Minn. and S. Dak.c	1,444,000	1,461,000	1,524,000	1,720,000	2,410,000	2,808,000	3,067,000
Western Mo., Neb., Kan. and Okla.	939,000	1,147,000	840,000	1,095,000	1,195,000	1,610,000	1,558,000
Texas	390,000	389,000	401,000	444,000	298,000	203,000	258,000
Colo. and Utah	279,000	216,000	275,000	221,000	188,000	344,000	350,000
California	992,000	1,073,000	1,010,000	1,123,000	365,000	423,000	473,000
Ore., Wash. and Montana	333,000	394,000	351,000	491,000	579,000	327,000	424,000
	13,538,000	15,387,000	15,036,000	17,501,000	14,903,000	16,326,000	18,440,000

a Revised. b Began producing and shipping June, 1924. c Began producing December, 1924, and shipping January, 1925.

Stocks of clinker, or underground cement, at the mills at the end of June, 1925, amounted to about 7,928,000 barrels compared with 9,053,000 barrels (revised) at the beginning of the month.

Production, shipments, and stocks of finished Portland cement, by months, in 1924 and 1925, in barrels.

Month	Production		Shipments		Stocks at end of month	
	1924	1925	1924	1925	1924	1925
January	8,788,000	8,856,000	5,210,000	5,162,000	14,155,000	17,656,000
February	8,588,000	8,255,000	5,933,000	6,015,000	16,815,000	19,689,000
March	10,370,000	11,034,000	8,995,000	10,279,000	18,189,000	20,469,000
1st quarter	27,746,000	28,145,000	20,138,000	21,456,000	.....	.....
April	11,726,000	13,807,000	12,771,000	14,394,000	17,159,000	19,877,000
May	13,777,000	15,503,000	14,551,000	16,735,000	16,403,000	18,440,000
June	13,538,000	15,387,000	15,036,000	17,501,000	14,903,000	16,326,000
2nd quarter	39,041,000	44,697,000	42,358,000	48,630,000	.....	.....
July	14,029,000	.....	16,614,000	.....	12,319,000	.....
August	15,128,000	.....	16,855,000	.....	10,666,000	.....
September	14,519,000	.....	16,827,000	.....	8,404,000	.....
3rd quarter	43,676,000	.....	50,296,000	.....	.....	.....
October	14,820,000	.....	17,160,000	.....	6,073,000	.....
November	13,141,000	.....	10,289,000	.....	8,928,000	.....
December	10,435,000	.....	5,506,000	.....	13,913,000	.....
4th quarter	38,396,000	.....	32,955,000	.....	.....	.....
	148,859,000	.....	145,747,000	.....	.....	.....

a Revised.

Distribution of Cement

The following figures show shipments from Portland cement mills distributed among the States to which cement was shipped during January, February, March, April and May, 1924 and 1925.

Portland cement shipped from mills into States, in January, February, March, April and May, 1924 and 1925, in barrels [a].

Shipped to	Year 1924	January 1925	February 1925	March 1925	April 1924	April 1925	May 1924	May 1925
Alabama	1,871,885	85,410	103,513	177,510	162,471	191,451	129,432	185,314
Alaska	6,304	132	0	294	231	709	637	0
Arizona	389,935	34,370	25,945	27,009	30,146	31,264	33,469	32,749
Arkansas	1,099,304	41,376	44,352	72,198	105,078	94,695	75,258	87,340
California	10,772,733	988,883	753,123	1,029,118	899,357	1,027,744	1,044,824	1,081,945
Colorado	1,334,493	42,425	69,871	102,537	111,833	131,363	141,894	125,744
Connecticut	1,576,021	34,810	50,026	113,668	143,013	160,616	166,717	177,292
Delaware	384,228	5,786	9,444	21,766	38,393	41,573	42,874	28,892
District of Columbia	718,146	37,285	65,176	58,474	55,800	70,765	51,807	103,996
Florida	2,155,836	265,463	227,811	272,094	140,291	261,180	170,110	313,846
Georgia	1,406,476	93,062	98,569	140,634	114,026	112,250	117,426	127,545
Hawaii	40,587	417	0	1,500	5,478	2,250	1,979	5,608
Idaho	262,142	2,598	11,029	17,667	30,538	28,393	28,199	28,613
Illinois	13,309,655	463,388	378,947	846,638	1,366,987	1,467,815	1,421,534	1,790,601
Indiana	5,492,150	139,782	143,464	255,597	454,111	433,996	523,774	569,436
Iowa	3,138,347	53,044	52,039	161,164	254,796	284,477	421,523	346,484
Kansas	2,128,898	33,588	120,405	212,402	248,942	232,220	247,164	242,880
Kentucky	1,727,038	52,013	68,970	115,222	156,403	174,795	145,624	195,351
Louisiana	1,255,952	75,992	97,638	98,193	140,357	108,250	106,977	99,402
Maine	386,092	4,837	5,238	21,702	34,998	36,163	45,512	38,435
Maryland	1,983,993	47,635	98,231	143,291	163,161	207,844	157,933	231,935
Massachusetts	3,352,294	113,101	134,591	257,381	309,111	344,406	364,354	374,243
Michigan	9,335,798	190,905	248,240	437,712	655,933	859,815	989,217	1,140,027
Minnesota	3,238,161	59,395	97,034	173,618	240,635	321,854	404,999	425,473
Mississippi	507,201	29,867	28,564	35,778	41,698	48,174	48,772	47,573
Missouri	3,929,248	115,141	162,992	379,157	392,769	489,316	391,946	652,330
Montana	202,541	5,334	6,093	16,450	23,446	23,030	28,421	28,170
Nebraska	1,496,892	31,832	46,281	99,780	153,517	180,951	154,977	198,338
Nevada	90,949	2,492	5,177	7,254	7,625	10,767	8,480	11,676
New Hampshire	377,917	9,419	15,911	27,592	35,556	39,906	37,609	36,814
New Jersey	6,345,124	157,612	243,534	498,227	537,307	722,751	593,922	721,605
New Mexico	236,644	7,911	10,320	18,865	24,154	19,699	37,588	17,141
New York	17,282,302	400,896	587,674	1,159,830	1,558,728	1,717,441	1,710,784	2,028,808
North Carolina	2,846,808	79,817	128,770	200,097	232,887	277,616	319,454	289,056
North Dakota	270,354	1,380	3,742	16,589	25,531	38,937	29,414	47,789
Ohio	9,201,578	259,628	271,075	592,069	752,723	894,683	863,045	1,054,230
Oklahoma	2,201,699	58,872	155,083	203,161	269,777	201,886	264,611	235,096
Oregon	1,205,672	54,117	60,816	103,813	120,593	101,661	113,812	129,048
Pennsylvania	12,950,829	288,916	421,519	808,636	954,720	1,250,501	1,093,389	1,482,560
Porto Rico	6,686	0	0	0	0	0	0	0
Rhode Island	612,344	15,668	17,908	54,083	56,400	79,063	73,437	72,914
South Carolina	571,372	46,840	73,312	72,929	49,837	65,806	51,285	74,198
South Dakota	472,154	4,331	14,528	40,697	37,602	57,039	49,995	66,445
Tennessee	1,590,992	69,669	87,499	116,856	147,706	133,037	155,684	163,812
Texas	3,844,187	260,540	345,057	381,320	389,892	401,517	359,570	373,605
Utah	429,630	3,794	16,821	28,567	45,073	33,469	62,439	41,447
Vermont	337,146	3,129	3,060	10,312	23,082	25,353	28,991	24,178
Virginia	1,685,953	54,445	95,942	132,891	179,862	160,139	156,109	154,167
Washington	1,831,348	85,969	90,669	151,814	167,640	180,845	192,570	265,735
West Virginia	1,663,250	45,912	56,629	85,703	147,927	134,357	149,396	140,992
Wisconsin	4,357,044	113,396	73,320	142,620	377,659	358,379	474,104	507,654
Wyoming	328,221	3,492	9,181	16,358	22,017	19,981	40,153	32,466
Unspecified	684,598	15,964	26,430	46,236	69,520	34,875	139,036	8,023
	144,927,151	5,092,090	5,961,563	10,205,073	12,707,337	14,327,067	14,462,230	16,659,016
Foreign countries	819,849	69,910	53,437	73,927	63,663	66,933	88,770	75,984
Total ship'd from cement plants	145,747,000	5,162,000	6,015,000	10,279,000	12,771,000	14,394,000	14,551,000	16,735,000

a Includes estimated distribution of shipments from three plants for April and May, 1924; from four plants for January and February, 1925; and from five plants for March, 1925 and five for April, 1925; and from four plants for May, 1925.

Production and Sale of Stone in 1924

PRODUCTION of stone in the United States in 1924, exclusive of stone manufactured into lime, cement, and abrasive materials, or crushed into sand, amounted to more than 102,366,000 short tons, valued at about $160,000,000, according to a preliminary compilation of reports from producers made by the Bureau of Mines, Department of Commerce. The figures indicate a reduction of about 1 per cent from the 1923 production figure of 103,327,460 short tons. The value of the 1924 production is practically the same as the 1923 figures, $159,947,241. Final figures for 1924 production may be somewhat greater than the preliminary figures.

Stone sold as building stone, curbing, flagstone, and crushed stone increased in quantity and stone sold as monumental stone, paving blocks, flux, and refractories decreased. The total of stone sold for rubble, riprap, manufacturing industries, and miscellaneous uses is estimated as slightly less than in 1923.

Building Stone

The building stone sold amounted to 27,860,000 cubic feet—5 per cent more than in 1923. This includes stone for architectural work and relatively low-priced stone for rough construction, such as foundations, bridges, sea walls, and unshaped face stone for buildings and retaining walls.

More than one-half of the building stone sold was limestone, about 14,200,000 cubic feet, the sales of which were apparently slightly less than in 1923. The largest quarry center for building limestone, the Bedford-Bloomington district in Indiana, reported sales of 11,005,570 cubic feet in 1924, a decrease of 6 per cent from 1923. There was also a slight decrease in the sales of high grade building limestone quarried at Russellville, Ala., and Bowling Green, Ky., but an increase in the sales at Mankato, Mantorville, Kasota, and Winona, Minn., and at Leuders, Tex. Total sales from the districts in Minnesota in 1924 were 274,660 cubic feet, valued at $569,000. Sales of limestone for rough cnostruction increased somewhat.

Total sales of granite for building stone (about 6,730,000 cubic feet, valued at $5,640,000), represented about one-fourth of the building stone produced in 1924, and an increase of about 26 per cent over 1923. The granite sold for architectural work, including rough and dressed stone, was approximately 1,658,000 cubic feet, valued at $4,813,000, an increase in quantity of about 30 per cent over 1923. Stone sold for rough construction also showed increased sales. The principal States producing granite for architectural building stone, Massachusetts (470,170 cubic feet), Maine (305,300 cubic feet), New Hampshire (176,580 cubic feet), North Carolina (127,440 cubic feet), and Minnesota (84,270 cubic feet), all showed increased production. Pennsylvania, Maryland, Massachusetts, and Maine also produced a considerable quantity of stone for rough construction work.

Total sales of sandstone for building (3,550,000 cubic feet, valued at $2,730,000) increased about 10 per cent in quantity. Sandstone for architectural work, including rough, sawed, and finished stone, amounted to 2,125,000 cubic feet, valued at $2,574,000, an increase in quantity of 8 per cent. Ohio produced 1,247,500 cubic feet—over one-half of the sandstone used for architectural building. New York produced 397,240 cubic feet. Kentucky, Pennsylvania, Washington, Massachusetts, and other States also reported considerable amounts.

Marble sold for building stone in 1924 amounted to 2,606,000 cubic feet, valued at $8,799,000, an increase of 7 per cent in quantity. The principal States producing building marble are Tennessee (791,900 cubic feet), Missouri (664,440 cubic feet), Vermont (585,470 cubic feet), and Georgia (227,960 cubic feet). Alabama, Alaska, Arkansas, California, Colorado, New Jersey, Pennsylvania, and Utah also furnish marble for building purposes. The product from Georgia and Missouri is chiefly for exterior building and that from Tennessee and Vermont for interior work. Serpentine (88,460 cubic feet, valued at $501,835) quarried in Maryland, Massachusetts, New Jersey, Pennsylvania, and Vermont is included in the marble figures. There was also sold 8,640 short tons of serpentine, valued at $89,347, chiefly for stucco and terrazzo work. The considerable increase in the ser-

pentine used for building was occasioned by the opening of new quarries in Windsor County, Vermont. The total sales of marble reported from Carthage, Mo., for 1924, were 461,470 cubic feet, valued at $866,799 practically the same quantity as in 1923. This includes a small quantity of monumental stone. Marble quarried at Phenix, Mo., chiefly for interior building work amounted to 213,360 cubic feet nearly 5 per cent more than in 1923.

Basalt and various miscellaneous varieties of stone used chiefly for rough construction showed decreased output for 1924.

Monumental and Memorial Stone

Stone sold for monumental and memorial work in 1924 amounted to about 4,740,000 cubic feet, valued at $15,192,000, a decrease of about 7 per cent in quantity.

Granite (including rough and dressed stone) reported as sold for this purpose, was 3,510,000 cubic feet, valued at $11,334,000, a decrease of 11 per cent in quantity. The principal States producing granite for monumental work in 1924 were Vermont (1,273,890 cubic feet, of which the Barre district produced 1,025,930 cubic feet), Massachusetts (426,120 cubic feet, of which the Quincy district produced 320,820 cubic feet), Minnesota (312,170 cubic feet), Maine (197,420 cubic feet), Rhode Island (174,060 cubic feet), New Hampshire (164,270 cubic feet), Georgia (137,700 cubic feet), and Wisconsin (114,930 cubic feet). These figures represent decreased sales for Vermont, Massachusetts, Minnesota, Georgia, and Wisconsin. The sales for New Hampshire were practically the same as reported for 1923 and Maine and Rhode Island showed increased sales. North Carolina and South Carolina also showed decreases in granite sold for monumental work in 1924. Importation of low-priced foreign granite for small sized monuments is given as one reason for the decrease in sales of domestic granite for memorial and monumental use.

Sales of marble for monumental work (including rough and finished stone) in 1924 were reported as 1,230,000 cubic feet, valued at $3,858,000, an increase of nearly 7 per cent in quantity. Vermont produced 739,830 cubic feet, Georgia 390,210 cubic feet, and Arkansas, Colorado, Massachusetts, Missouri, New York, North Carolina and Tennessee much smaller amounts.

Street and Road Work and Concrete

Street and road material in general showed increased sales in 1924, although sales of paving blocks (40,883,000 blocks, valued at $3,568,000) decreased nearly 11 per cent in quantity. Stone sold for curbing (3,794,000 cubic feet, valued at $3,458,000) increased over 17 per cent in quantity, and stone sold for flagstones (809,000 cubic feet, valued at $558,000) increased 33 per cent. The increased use of flagstones was for yard and garden walks, in competition with concrete and gravel. Total crushed stone amounted to about 67,400,000 short tons, valued at $73,700,000 in 1924, an increase of 8 per cent in quantity, although final figures may show a somewhat higher percentage of increase. Crushed stone for concrete and road work (56,900,000 tons, valued at $64,900,000) increased 11 per cent in quantity, and crushed stone reported as used for railroad ballast (10,500,000 tons, valued at $8,800,000) decreased about 7 per cent.

Fluxing Stone

Stone sold for fluxing to blast furnaces, open hearth steel works, smelters, and other metallurgical plants, amounted to about 19,860,000 short tons, valued at $15,888,000, a decrease of 22 per cent in quantity.

Refractory Stone

Stone reported for refractory use, which includes dolomite, quartzite, and mica schist, amounted to 988,000 tons, valued at $1,302,000 in 1924, a decrease in quantity of 14 per cent, and reflects, as does the decrease in fluxing stone, the lessened activities of metallurgical furnaces. Raw dolomite reported as sold for the manufacture of refractories in 1924 amounted to about 203,000 short tons, valued at $200,000. Besides this quantity, operators who both quarry and dead-burn or sinter dolomite reported 328,700 tons of sintered material, valued at $3,161,000. The quantity of raw dolomite reported was about the same as in 1923, and the sintered material decreased 8 per cent. Quartzite (ganister) used in the manufacture of refractory brick, for furnace lining and for the manu-

facture of ferro-silicon, amounted to 756,630 short tons, valued at $981,906. This was a decrease of about 17 per cent in quantity. Sales of mica schist for furnace and kiln lining, which is quarried in Montgomery County, Pa., near Edge Hill, amounted to 28,810 tons, valued at $120,370, a decrease in quantity of 25 per cent.

Sales in 1924 of pulverized limestone for agricultural use amounted to about 1,332,000 tons, valued at $1,938,000, an increase of 4 per cent in quantity over the sales for 1923.

Recent Patents

The following patents of interest to readers of this journal recently were issued from the United States Patent Office. Copies thereof may be obtained from R. E. Burnham, patent and trade-mark attorney, Continental Trust Building, Washington, D. C., at the rate of 20c each. State number of patent and name of inventor when ordering.

1,541,887. Screen. Herman F. Wullstein, Salt Lake City, Utah.

1,542,974. Power excavating - machine and method of actuating the same. Arthur C. Vicary, Erie, Pa., assignor to Erie Steam Shovel Co., same place.

1,542,981. Power excavating-machine and method of actuating the same. Edwin J. Armstrong, Erie, Pa., assignor to Erie Steam Shovel Co., same place.

1,542,982. Power excavating - machine and method of actuating the same. Edwin J. Armstrong, Erie, Pa., assignor to Erie Steam Shovel Co., same place.

1,543,250. Excavating - machine. Robert R. Downie, Beaver Falls, Pa., assignor to Keystone Driller Co., same place.

1,543,435. Coaling device. Grant Holmes, Danville, Ill., assignor to Marion Steam Shovel Co., Marion, Ohio.

1,543,516. Cutter - head for coal-cutting machines. Thomas E. Pray, Chicago, Ill., assignor to Goodman Mfg. Co., same place.

1,543,771. Power - shovel. Samuel T. Hoar, Meaderville, Mont.

1,543,838. Excavating - machine. John G. Fogarty, Rochester, N. Y.

1,544,054. Excavating - machine. Edwin J. Armstrong, Erie, Pa., assignor to Erie Steam Shovel Co., same place.

1,544,066. Mining-machine. Morris P. Holmes, Claremont, N. H., assignor to Sullivan Machinery Co., same place.

1,544,067. Mining-machine. Morris P. Holmes, Claremont, N. H., assignor to Sullivan Machinery Co., same place.

1,544,068. Mining-machine. Morris P. Holmes, Claremont, N. H., assignor to Sullivan Machinery Co., same place.

1,544,069. Mining-machine. Fred T. Lobbey, Winslow, Ind., assignor to Sullivan, Machinery Co., Claremont, N. H.

1,544,070. Mining-machine. Morris P. Holmes, Claremont, N. H., assignor to Sullivan Machinery Co., same place.

1,544,071. Mining-machine. Morris P. Holmes, Claremont, N. H. assignor to Sullivan Machinery Co., same place.

1,544,072. Mining-machine. Morris P. Holmes, Claremont, N. H., assignor to Sullivan Machinery Co., same place.

1,544,073. Mining-machine Robert C. Osgood, Claremont, N. H., assignor to Sullivan Machinery Co., same place.

1,544,074. Mining-machine. Morris P. Holmes, Claremont, N. H., assignor to Sullivan Machinery Co., same place.

1,544,075. Mining-machine. Morris P. Holmes, Claremont, N. H., assignor to Sullivan Machinery Co., same place.

1,544,076. Mining-machine. Edmund C. Treese, Huntington, W. Va., assignor to Sullivan Machinery Co., Claremont, N. H.

1,544,077. Mining - machine. Edmund C. Treese, Huntington, W. Va., assignor to Sullivan Machinery Co., Claremont, N. H.

1,544,222. Dipper-tooth point for excavating-shovels. Oliver Crosby, St. Paul, Minn., assignor to American Hoist & Derrick Co., same place.

1,544,398. Mining-machine. Morris P. Holmes, Claremont, N. H., assignor to Jeffrey Mfg. Co., Columbus, Ohio.

1,544,839. Gravel-dump. Theodore A. Hartung, Austin, Tex.

1,545,098. Clamshell-bucket. Edward L. Harrington, Erie, Pa., assignor to G. H. Williams Co., same place.

1,545,099. Clamshell-bucket. Edward L. Harrington, Erie, Pa., assignor to G. H. Williams Co., same place.

1,545,248. Rock-crushing machine. Percy E. Garrestson, Columbus, N. J.

Gypsum Mined and Shipped in 1924

The quantity of gypsum mined in 1924 was 5,042,629 short tons, an increase of 289,181 tons, or 6 per cent, over 1923, according to a statement made public by the Bureau of Mines, Department of Commerce. The value of sales of both crude and calcined gypsum was $42,724,507, an increase of $7,836,352, or 22 per cent; 3,568,569 tons was sold calcined and 982,108 tons in crude form, chiefly for use in Portland cement but including 22,298 tons sold as agricultural gypsum. The figures are based on reports submitted by 72 operators of gypsum mines to the Mineral Resources Division of the United States Geological Survey before the transfer of that division to the Bureau of Mines.

Gypsum Produced and Sold in the United States, 1924, by States

State	Number of active plants reporting	Total quantity mined (short tons)	Sold without calcining		Sold calcined		Total value
			Short tons	Value	Short tons	Value	
Iowa	6	727,385	150,450	$ 375,155	489,745	$5,277,910	$5,657,339
Kansas	3	141,908	47,509	116,681	77,796	777,512	894,262
Michigan	8	577,526	577,134	324,140	[453,135]	5,626,682	5,950,822
Nevada	6	365,714	(a)	(a)	278,467	2,001,130	2,063,089
New York	13	1,474,491	335,841	982,777	1,019,319	13,346,469	14,329,246
Ohio	4	525,485	17,757	49,579	477,845	5,563,913	5,620,099
Oklahoma	5	316,134	64,980	157,748	201,762	2,442,333	2,600,081
Texas	7	402,245	32,233	62,314	301,512	2,566,736	2,629,110
Utah	4	90,221	34,793	41,104	43,590	292,253	335,588
Wyoming	3	32,715	(a)	(a)	25,095	189,871	190,344
Other States b	13	388,805	c174,411	c564,822	200,303	1,965,378	2,454,527
Total	72	5,042,629	982,108	2,674,320	3,568,569	40,050,187	42,724,507

a Included under "Other States."
b Arizona, California, Colorado, Montana, New Mexico, Oregon, South Dakota, and Virginia.
c This figure includes also output of States entered as "(a)" above.

Sales of Slate in 1924

Final returns on slate produced in the United States in 1924 as submitted by the producers show sales of approximately 728,000 short tons, valued at $11,776,016, it is announced by the Bureau of Mines, Department of Commerce. This represents an increase of about 3 per cent in quantity but a decrease of about 2½ per cent in value.

The slate industry falls into three groups, roofing slate, milled stock, and crushed slate for granules and "flour". The first two groups are closely connected and a strike in some of the quarries in the Pennsylvania district in 1924 materially decreased the sales of both these classes of products. Sales of crushed slate granules, on the other hand, continued to increase as they have done since the beginning of trade in that product.

Sales of slate for roofing amounted to 469,393 squares, valued at $4,626,614, a decrease of 7½ per cent in quantity and an increase of nearly 1 per cent in value. The average value a square was $9.03 in 1923 and $9.86 in 1924.

Sales of mill stock, which includes slate for electrical, and structural and sanitary uses, for vaults and covers, black boards, bulletin boards, billiard table tops, and school slates, amounted to 10,011,180 square feet, valued at $3,922,828, a decrease of nearly 10 per cent in quantity and 6 per cent in value. All these milled products decreased in quantity in 1924, except that sold for vaults and covers. The decreased sales of electrical slate were said to be due, aside from the strike, in part to substitution of manufactured material and in part to the use of stone imported for this purpose. Nevertheless the shortage caused by the strike was responsible for increase in the imports of foreign stone.

Sales of slate roofing granules for the surfacing of prepared roofing, and of slate "flour" used as a filler, amounted to 512,810 short tons, valued at $3,178,454, an increase of 11 per cent in quantity and a decrease of less than 3 per cent in value.

Sales of slate were also reported for flagstones and stepping stones and small quantities for tombstones, posts, and other uses.

Feldspar at Bedford, N. Y.

THE feldspar mines located at Bedford, Westchester County, N. Y., right in the heart of the suburban residential section of Westchester County, forty miles from New York City, are rather unique and worthy of mention to the users of feldspar.

The mines are owned and controlled by the Bedford Mining Company Inc., who also operate a grinding plant at the mines. The original openings in the mines now being operated took place over fifty years ago. After a short operation of mining only with most primitive methods it was given up. These same mines, however, have been actively operated with a mill in connection for a period of over thirty years to date.

There are three distinct materials produced from the same mines. They are potash feldspar, soda feldspar and rock quartz. The potash feldspar is of exceptional quality being very high in potash and alumina, low in silica and very low in iron content. It is inclined in the crude state to be somewhat pink in color and not a pure white when seen in the groundstate, but it fires white. It is quite similar in appearance to Canadian feldspar. The soda feldspar is, as far as known to the Bedford Company, the only real soda feldspar being produced. This statement is based entirely upon the uniform run of sodium in the material, the soda exceeding the potash content by double. This particular material has not changed to the best of the company's knowledge since it was first produced. In fact there are customers now using this spar, who have used it without interruption for a period of over fifteen years. It is quite high in silica, low in iron content, high in soda and low in potash. The quartz produced is of high quality a considerable part of it being rose quartz. This quartz is sold with practically no exception to one concern which has used the output of these mines for thirty years.

The grinding plant is equipped with Hardings mills for the pulverizing work. In fact this plant was the pioneer user of a Hardinge mill for feldspar grinding. The mill at this time is turning out just one mesh of grinding and that is 90/100 mesh. There are a few exceptions to this, however, in a few customers who for years have used this material and for whom they grind either to 120 or 140 mesh.

In addition to the mines now being operated, which as before stated have been in active operation for over thirty years and which to all appearances are good for thirty years more, the Bedford Mining Company owns another tract adjoining the present mine, consisting of 100 acres which feldspar tract is being held in reserve. There is also another tract of land adjoining the present mines totaling about 45 acres practically every acre of which is proven feldspar deposits of excellent quality. This land is under option by the Bedford Mining Company and will be taken up before the option expires.

Furnace Consolidation

The Dempsey Furnace Company, Jersey City, N. J., has been consolidated with the W. N. Best Corporation, 11 Broadway, New York City.

The combined furnace business of the two companies will be operated as the Dempsey Furnace Division of the W. N. Best Corporation under the personal direction of Mr. H. B. Dempsey.

With increased facilities of manufacture and a more complete line of industrial furnaces, the Dempsey Furnace Division of the W. N. Best Corporation is prepared to speedily serve the requirements of industrial furnace users with furnaces of the highest standard of design and construction.

New Denver Bulletin

The Denver Rock Drill Manufacturing Company has issued a bulletin descriptive of their new model 39 Waugh Turbro Stoper. This is the stoper so successfully used in the upper enlargement of the Moffat Tunnel. Its outstanding features briefly enumerated are:—turbine driven rotation is mechanically correct; fatigue on the operator is greatly reduced; steel troubles are practically eliminated; lineal footage per drill is materially increased; the water jet protects the health of the miner.

The bulletin is very attractively prepared and well illustrated. The machine is discussed in detail and a complete set of specifications accompanies the description.

Freight Car Loading

Loading of revenue freight for the week ended on July 11 totaled 982,809 cars, according to reports filed by the carriers with the car service division of the American Railway Association.

Compared with the corresponding week last year, this was an increase of 72,826 cars but a decrease of 37,000 cars under the corresponding week in 1923. The total for the week of July 11 was an increase of 118,357 cars over the preceding week, when loadings were curtailed somewhat due to the observance of Independence Day, all commodities showing increases as compared with the week before.

Loading of merchandise and less than carload lot freight amounted to 253,142 cars, an increase of 28,352 cars over the week before and 18,856 cars above the same week last year as well as 12,358 cars over the same week two years ago.

Coal loadings totaled 160,444 cars, an increase of 26,414 cars over the preceding week and 14,265 cars above the same week last year. Compared with the corresponding week two years ago, however, it was a decrease of 33,478 cars.

A comparison by weeks follow:

	1925	1924	1923
July 11	982,809	909,973	1,019,809
July 4	864,452	757,904	850,082
June 27	991,341	908,251	1,021,471
June 20	982,600	803,546	1,005,432
June 13	987,106	902,592	1,008,838
June 6	994,874	910,793	1,012,312
May 30	920,514	986,209	820,551
May 23	986,209	918,214	1,015,532
May 16	984,916	913,201	992,319
May 9	981,370	908,213	974,078
May 2	981,711	913,550	961,617
April 25	959,225	878,387	962,578
April 18	922,778	876,916	970,042
April 11	917,284	880,937	945,271
April 4	922,375	861,990	896,375
March 28	931,895	907,389	896,735
March 21	909,363	908,290	916,818
March 14	924,149	916,762	904,116
March 7	930,009	929,381	905,344
Feb. 28	862,910	944,514	916,624
Feb. 21	925,295	945,679	830,187
Feb. 14	902,877	935,589	816,646
Feb. 7	928,244	906,017	849,352
Jan. 31	896,055	929,623	865,314
Jan. 24	924,254	894,481	896,464
Jan. 17	932,150	894,851	864,297
Jan. 10	932,807	872,023	873,908
Jan. 3	765,727	706,292	727,246

Mr. Arthur Assumes Broader Lime Association Activities

The Board of Directors of the National Lime Association at a meeting held in Chicago on July 9, 1925, approved the following changes in policy and personnel of the Association: Mr. G. B. Arthur, District Manager of the Central Division, Chicago, was appointed Assistant to the President, with direct general charge of all scientific, field and general publicity work of the Association and its Divisions.

The purpose of this move was to relieve Mr. Burton A. Ford, Secretary and General Manager, of certain technical supervision so that he might be able to devote all of his time to the increasing secretarial and business duties of the Association. It also places a man who is a trained engineer (Mr. Arthur) in general charge of the technical and field work so as to bring about a direct tying-in and coordination of the research work with the field work. Mr. Arthur is well qualified for the position by virtue of his three years of efficient work as Manager of the Central Division. The appointment of a successor to Mr. Arthur as District Manager will shortly be made. He will continue in general direction of the District Field Managers, when selected by the Divisions.

Mundy Expanding

Ground was broken on Tuesday, July 14th, for the new factory building of the J. S. Mundy Hoisting Engine Company, Newark, New Jersey. This structure will be two story, 40 feet by 140 feet. It will be built of reinforced concrete brick and steel of similar architecture as the present buildings. The second floor will be occupied by the Engineering Department, Advertising Department, Cost Department and Pattern Shop. The ground floor will be used for a Machine Shop which will be equipped with the most improved type of rapid production machine tools. The new building is expected to be ready for occupancy on or about October 1st of this year.

The Mundy Hoisting Engine Company has added many new high grade machine tools during the past year to take care of the increase in volume of business. At the present time new catalogs are being prepared for distribution in the early Fall.

The Internal Combustion Engine Development

With Special Reference to Red Seal Engines

By L. J. Kanitz, Continental Motors Corporation

THE DEVELOPMENT of the internal combustion engine has been a very interesting evolution. Perhaps some of the first attempts to develop an engine in accordance with internal combustion principles was some two hundred years ago, when gun powder was used as an explosive force to drive the piston.

In England, in 1826, about the time when strenuous efforts were being made to develop the steam engine, it is believed that the first internal combustion engine which actually did work was patented. It was known as the Brown gas vacuum engine. From that time until just about the beginning of our Civil War in the early sixties, considerable development work was done in France and England, gradually increasing the ability of the internal combustion engine to do work.

Shortly after the Civil War, American engineers began to look out for a kerosene and gasoline engine, and considerable work was done in this country towards patenting and manufacturing various types of internal combustion engines.

About 1900, in Chicago, Mr. Ross W. Judson, who by the way was one of the original organizers of the present Continental Motors Corporation, and who is now its president, developed an L-head type internal combustion engine which at that time was the most advanced of its kind in the world. At about this time the industry in the United States began its present intensive specialization on internal combustion engines, the Continental Motors Corporation taking the leading part in intensive specialization in designing and manufacturing Red Seal internal combustion engines.

With reference to the application of the gasoline engine for industrial purposes, it is within the memory of most of the readers of this article that such evolution has taken place. You perhaps all recall the one-cylinder, slow-moving, large flywheel type of hit-and-miss ignition system. This slowly gave place to a smaller and more compact multi-type cylinder 4-cycle principle engine.

It is believed that some of the greatest strides were made in the adaptation of the gasoline engine to industrial application just prior to and during the World War. You will recall that due to the inability of the steam engine to meet the requirements of tank, artillery, submarine and aircraft work, intensive effort was put forth to develop gasoline engine power for these purposes, as well as for operating portable electric light plants, radio and communication systems and much other work where only gasoline power, because of its mobility and ease of operation, could take care of the demands for dependable portable power.

The field for the gasoline engine for purposes other than automotive has been rapidly expanding, especially in the past two or three years. Nearly every day new applications are suggested and worked out satisfactorily. There are given in the following paragraph some of the many present applications for which the gasoline engine is serving in a more satisfactory and economical manner than any other type of power available for the purpose:

In the construction field, for use on concrete, plaster and mortar mixers, pumps, saw rigs, drills, air compressors, all types of excavating equipment, industrial locomotives, hoists, wagon loaders, conveyors, back fillers, trench machines, cranes, derricks, shovels, road finishing machinery and other types of equipment, gasoline engines are readily adaptable.

In the oil industry the gasoline engine is especially desirable because of its ability to use the fuel generally obtainable at the place where the unit is working. Some of the applications for which the engine is used in this field are driving pumps, hoists, oil drilling machinery, and fire protection equipment.

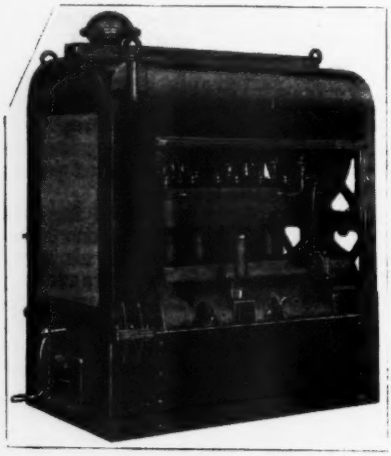
In the agricultural field, tractors, spraying pumps, insect exterminators, cultivators, combination harvesters and threshing machinery, corn huskers, hay balers, wood sawing machinery, butter making and churning equipment, and farm lighting plants are some of the farm equipment now being powered successfully by the gasoline engine.

In the railroad industry motor rail

coaches, water tower pumping equipment, inspection crew cars, electric welding equipment, track shifting machinery and storage battery charging equipment are using gasoline power.

In the lumber industry where fire prevention work is of considerable importance the gasoline engine is successfully operating on logging railroads, special log moving equipment, fire prevention work, portable saw mills, log skidding equipment and tractors.

In the mining industry the multi-type cylinder internal combustion engine is used for electric generating plants, pumping plants, hoisting machinery, power shovels, crushing equipment, conveyors, air compressors, fire prevention equipment, ventilating and blower systems, and standby power in general.



Four Cylinder Red Seal Industrial Motor Tohe Kingsford Pump

Most of the applications noted under the special industrial groups are represented in the industrial field at large. However, it is suggested in addition to the above there is the general marine field and aircraft industry. A careful analysis of the industrial field leads the writer to the conclusion that the development has been so rapid that not much time has been given to standardization of specifications covering prime movers in each field.

It has been noted from time to time at various meetings of engineering societies that efforts are being made to accomplish a standardization of specifications for each group that will eventually result in much saving to the manufacturer and ultimate consumer. But at the present time, with industrial application in more or less of a development stage, we should all endeavor to assist in every way possible the standardization programs being undertaken by the various engineering societies.

It has also been noted that many manufacturers who have been using internal combustion engines as prime movers on their various types of machinery are just beginning to give considerable thought to the source of their engine supply. Competition is rapidly compelling the manufacturers to look into their engine supply sources with reference to the possibility of getting delivery of engines under all conditions through which industry passes during a period of years.

The permanency of their engine supply seems to be one of the thoughts predominating in the minds of the purchaser of gasoline engines. Ability to obtain service on the gasoline engine in the field now, and ten years from now, where the same engine is necessary, is also a point the executives are giving considerable thought, as well as national and international service for replacement parts.

The engineers responsible for certain types of equipment requiring gasoline engine power have lately shown considerable interest in engine sources of supply, especially as regards the engineering department of their gasoline engine sources,—its ability to develop an engine to take care of the specific purposes in which the engineer is interested. This condition naturally leads them to the company which has been for practically a quarter of a century, devoting its entire resources to engineering and manufacturing Red Seal units.

Some ten years ago, Mr. W. R. Angell, vice-president of the Continental Motors Corporation, and Mr. W. A. Fredericks, vice-president and consulting engineer of the same company, made a very careful analysis of the industrial field and decided that the time was rapidly coming when other types of portable power would be considerably displaced by the gasoline engine. The analysis and forecast of the above named gentlemen have been ably substantiated as was revealed by a recent survey covering the types of portable power now used in general industry.

Production of Sodium Compounds And Borates in 1924

The production of sodium compounds, not including common salt, from natural salines and brines in the United States in 1924 amounted to 76,420 short tons, valued at $1,825,850, it is announced by the Bureau of Mines, Department of Commerce. These figures show an increase of 29 per cent in quantity and of 3 per cent in value over 1923. They cover the output of sodium carbonate, bicarbonate, sulphate, trona, and borate in various forms.

Sodium carbonate (soda ash) and sodium bicarbonate were produced from Owens Lake by the Inyo Chemical Co., at Cartago, and the Natural Soda Products Co., at Keeler, Calif. There was an increase in the sales of each of these products as reported in 1924, but a decrease in average value a ton. Hydrated sodium carbonate (sal soda) was produced by the Wyoming Soda Products Co., at Green River, Sweetwater County, Wyoming. Sodium sulphate (salt cake) was produced at Clarkdale (P. O. Camp Verde), Yavapai County, Ariz., by the Western Chemicals, Inc.; near McKittrick, Calif., by the Pacific Distributing Corporation of Nevada; and at Wabuska, Nev., by George Elder. The properties at Clarkdale, Ariz., and Wabuska, Nev., were producing for the first time in 1924. Hydrated sodium sulphate (Glauber's salt) was produced at Casper, Wyo., by D. W. Gill. Trona, a double salt of sodium carbonate and sodium bicarbonate, was produced by the Natural Soda Products Co., at Keeler (Owens Lake), and by the American Trona Corp., at Trona (Searles Lake), Calif.

The output of boron minerals in 1924 amounted to 116,110 tons, valued at $3,183,910, compared with 136,650 short tons, valued at $3,994,790 in 1923. These include borax (sodium borate) produced at the plant of the American Trona Corp., Trona, Calif., and colemanite (calcium borate) mined at Death Valley Junction and Lang, Calif., by the Pacific Coast Borax Co.; at Muroc, Calif., by the Suckow Chemical Co.; at Las Vegas, Nev., by the Westend Chemical Co.; and at Moapa, Nev., by the American Borax Co.

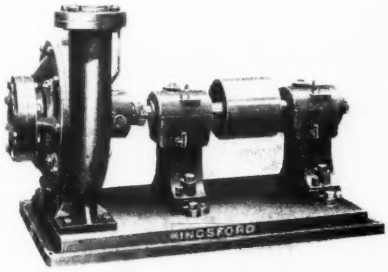
It is reported that the exploitation of deposits of sodium salts may soon be undertaken near Tonopah, Nev., Salt Lake, Utah, and in Okanogan County, Washington.

Kingsford Extra Heavy Centrifugal Pumps

The Kingsford Foundry and Machine Works, of Oswego, N. Y., are now offering to the non-metallic industries their high-grade extra heavy side suction pumps, supplied for the last two years to the chemical industry replacing the standard commercial side suction pumps.

The open type impeller, especially suitable for handling abrasive and semi-fluid liquids liable to clog, in connection with the renewable side plates, all subject to maximum wear, can be easily replaced at minimum expenditure. Impeller and renewable side plates are being furnished in either hard white iron, steel, manganese, bronze, monel metal or any other composition.

Other features, found only in the highest grade double suction pumps and entirely absent in the commercial side suction pumps, are: extra deep stuffing box with renewable throat bushing, with provision for clear water flushing; independent water seal ring; split gland with water flinging shield; two oil ring bearings with renewable and split babbitted bearing shells; double ball thrust bearing of the self-aligning type and fully enclosed in oil. In addition, the stuffing box as well as the pedestal bearings are arranged for water cooling, ready for connection when deemed advisable.



The Kingsford Pump

The above cut shows a 3 inch pump arranged for belt drive. Motor driven pumps retain the two pedestal feature, shaft being extended beyond the outer bearing for coupling connection and a longer base is furnished for mounting motor.

Pumps are furnished in 2 to 6 inch sizes inclusive.

Sales of Feldspar in the United States in 1924

The crude feldspar sold in the United States in 1924 amounted to 203,000 long tons, valued at $1,488,500, or $7.32 a ton, according to a statement prepared from reports received directly from producers and issued by the Department of the Interior, through the Geological Survey, in cooperation with the State geological surveys of Maryland, New York, North Carolina, and Virginia. These figures show an increase of 40 per cent in quantity and 41 per cent in value as compared with 1923. Feldspar was mined and sold in 1924 in Arizona, California, Colorado, Connecticut, Maine, Maryland, New Hampshire, New York, North Carolina, Pennsylvania, South Dakota, and Virginia, a gain of one State—South Dakota—as compared with 1923. The greatest feldspar-producing region is in the Atlantic seaboard States from Maine to North Carolina. This region reported 95 per cent of the output for 1924. North Carolina, the leading State, reported about 47 per cent of the quantity sold; New Hampshire, the second, reported 19 per cent; and Maine, the third, 15 per cent. The average value per long ton in North Carolina was $6.46; in New Hampshire it was $8.22; and in Maine it was $9.07.

Except for a few minor purposes feldspar is prepared for use by grinding. This work is done principally by commercial mills, but a very small proportion is ground by the users in their own mills. In 1924 there were 32 commercial mills operated in California, Connecticut, Delaware, Illinois, Maine, Maryland, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, and Tennessee. These mills reported 189,780 short tons of ground feldspar sold in 1924, valued at $3,283,170, or $17.30 a ton. Of this quantity 163,905 tons, valued at $2,760,286, or $16.84 a ton, was domestic feldspar, and 25,875 tons, valued at $522,884, or $20.21 a ton, was Canadian feldspar. Canadian feldspar was ground in two States—New York and Ohio. These figures represented small increases in quantity and value of both domestic and ground feldspar as compared with 1923.

The production of crude feldspar by States in 1923 and 1924 is shown in the following table.

Crude feldspar produced and sold in the United States in 1923 and 1924

State	1923 Long tons	1923 Value[b]	1924[a] Long tons	1924[a] Value[b]
Arizona	(c)	(c)	(c)	(c)
California	9,297	$62,499	8,000	$62,300
Colorado	(c)	(c)	(c)	(c)
Connecticut	8,780	75,379	6,500	51,400
Maine	25,029	230,122	29,900	271,300
Maryland	2,750	17,010	4,800	25,000
New Hampshire	23,220	171,789	39,400	324,000
New York	15,161	127,477	13,800	108,700
North Carolina	57,622	360,636	96,000	620,000
Pennsylvania	2,069	6,355	1,400	4,700
South Dakota	.....	.....	(c)	(c)
Virginia	(c)	(c)	(c)	(c)
Undistributed	1,076	6,328	3,600	21,100
	145,004	1,057,595	203,400	1,488,500

a Figures for 1924 are preliminary and subject to revision.
b Value at mine or nearest shipping point.
c Included under "Undistributed."

New Incorporations

Maury Island Sand & Gravel Company, Everett, Wash., Capital stock $20,000; incorporators, H. P. Howard, T. G. Collins and James Chisholm.

Anchor Sand and Gravel Company, Columbus, Ohio, $5,000; incorporators R. D. and Hattie Houston, Walter P. and Edith Bohn and Effie Feight.

Reliance Whiting Co., Alton, Ill., increased Capital stock to $200,000.

J. W. Williams Slate Co., Montpelier, Vt., $100,000.

Midwest Portland Cement Co., Denver, Colo., $6,000; Ben Gibson, J. B. Gunn and W. G. Lewis.

Wilson Sand and Gravel Co., Huntington, W. Va., $1,000,000; C. R. Wilson, 1400 Fifth Avenue.

Greenville Gravel Corporation, Greenville, Ohio, $10,000; R. H. Jamison, J. H. Kellog, M. J. Brickman, N. B. Wilson and A. M. Berghoff.

Eastern Cast Stone Co., Malden, Mass., $100,000; Louis Adelson, Victor and Abraham S. Goldman, all of Boston. Contract awarded for $50,000 plant.

Preston Rock Co., Pasadena, Calif., 500,000; Geo. W. and Alice V. Preston and Fred C. Harris of South Pasadena, Walter S. McEachern and Della T. Neff of Pasadena.

A Faith That Moves MOUNTAINS

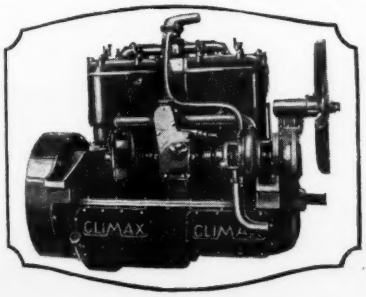
Exchequer Dam, constructed by Bent Bros., Inc., M. H. Sloeum, Supt., Los Angeles, Calif.

Climax "Trustworthy" Engines are used as Standard Equipment by:

Bay City Dredge Works, Bay City, Mich.
Brown Hoisting Mach. Co., Cleveland, Ohio
Byers Machine Co., Ravenna, Ohio
Davenport Locomotive Wks., Davenport, Ia.
Equitable Asphalt Maintenance Co., Kansas City, Mo.
Fate-Root-Heath Co., Plymouth, Ohio
Four Drive Tractor Co., Big Rapids, Mich.
Greiman Ditcher Co., Inc., Garner, Iowa
Industrial Works, Bay City, Mich.
J. T. Tractor Co., Cleveland, Ohio
Kennison Mfg. Co., Solomon, Kans.
Keystone Driller Co., Beaver Falls, Pa.
Lidgerwood Mfg. Co., New York, N. Y.
Link-Belt Co., Chicago
Locomotive Crane Co., Champaign, Ill.
McMyler-Interstate Co., Cleveland, Ohio
Mid-West Locomotive Wks., Cincinnati, O.
Mundie Mfg. Co., Peru, Ill.
J. S. Mundy Hoisting Eng. Co., Newark, N. J.
National Hoisting Eng. Co., Harrison, N. J.
Northwest Engineering Co., Chicago, Ill.
O. K. Clutch & Mach. Co., Columbia, Pa.
Orton & Steinbrenner Co., Chicago, Ill.
Osgood Co., Marion, O.
Parsons Co., Newton, Ia.
Rix Compressed Air & Drill Co., San Francisco, Calif.
Russell Co., Massillon, Ohio
Vulcan Iron Works, Wilkes-Barre, Pa.
Geo. D. Whitcomb Co., Rochelle, Ill.
Wisconsin Tractor Co., Sauk City, Wis.
W. T. Young Engine Co., Oil City, Pa.

THE above scene of the building of the mammoth Exchequer Dam is a striking illustration of the contractor's faith in the Trustworthy Power of Climax Engines. This dependable power plant operating Plymouth Gasoline Locomotives as a haulage unit put the immense amount of material into place. Truly here is Engine "Faith" that moves mountains.

Climax Engineering Co., 13 W. 18th Ave. Clinton, Ia.
Also Builders of Climax Refrigerating Units



SUCCESSFUL ENGINEERING GOOD AGE CAR COMPANY

Chicago Branch: Climax Engineering Sales Co. 610 W. Randolph St., Chicago, Ill.

Eastern Branch: 30 E. 42nd Street, New York, N. Y.

Los Angeles Branch: Coast Machinery Corp. 464-66 E. 3rd St., Los Angeles, Calif.

Cleveland Branch: 657 Leader Building Cleveland, Ohio

Be sure your machines are equipped with

CLIMAX *Trade Mark Reg. U. S. Pat. Off.*

The "Trustworthy" Engine

New Improved Ottumwa Portable Handy Belt Loader

The new and improved Ottumwa Portable Handy Belt Loader manufactured by the Ottumwa Box Car Loader Company at Ottumwa, Iowa and illustrated herein is a radical improvement in this type of loaders. The machine is equipped with roller and ball bearings, the ordinary lubricating system is replaced with the latest, improved Alemite greasing system, the height of the conveyor may be adjusted to suit varying conditions, a large four-foot diameter wheel is used to make possible the easy moving of the same from point to point as well as making it easy to move the loader over obstructions, the principal bearings are protected with felt washers. The loader has been scientifically balanced so as to be readily and easily moved about with little effort by one man.

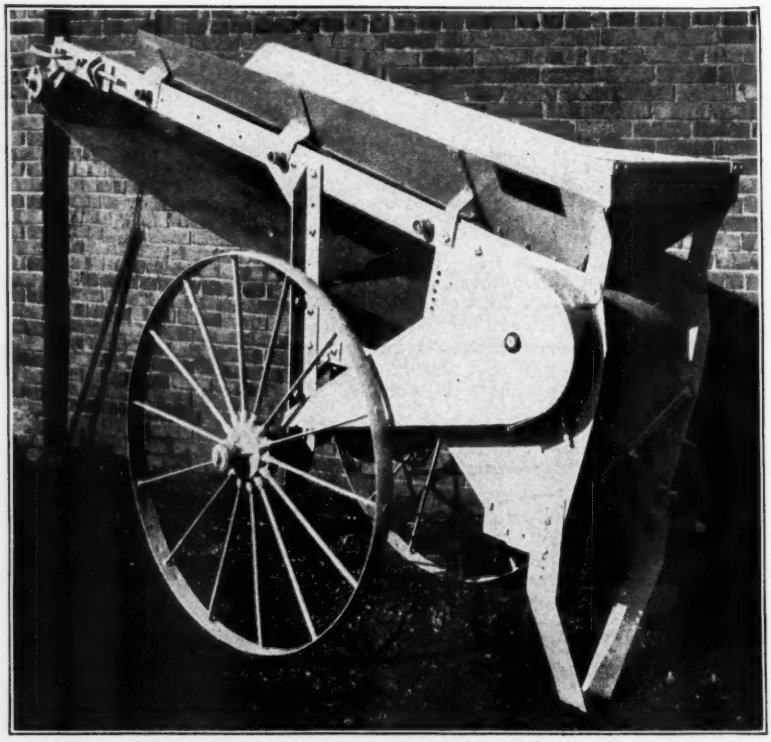
The services of only one man a small part of his time, the company claim, will do all the loading and will replace an entire loading gang. The illustration of this loader which appeared in the July first number of Pit and Quarry was published by error. The illustration accompanying this article shows the improved machine.

New Link-Belt Book

Link-Belt Company has just announced the publication of a new sixty-eight page book describing new methods for handling coal and ashes in boiler houses.

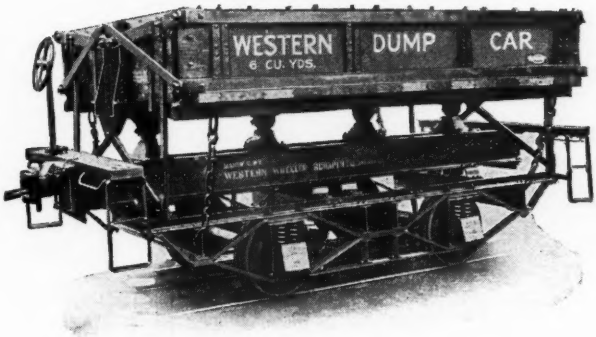
The book is beautifully illustrated; showing installations of the Peck Carrier in the boiler houses of many public Buildings, such as the new Tribune Tower in Chicago, and in many industrial plants throughout the United States.

It also contains much data of interest to engineers and architects; and is of particular value to anyone interested in boiler houses and their equipment. The Peck Carrier is also used for handling Cement, Sand, Ore and other materials.



The New Improved Ottumwa Loader

Your Haulage is the Key to Production



Western 6-yard dump car installed where standard gauge equipment is desired

PIT and Quarry managers seeking to maintain high production and low costs usually install Western side dump cars for haulage. They can be depended upon to keep your shovel and your crusher producing and the cost of their maintenance is low. Inferior dump cars are a costly extravagance limiting production at both shovel and crusher.

Western
That's Why

May we analyze your haulage conditions with a view to increasing production and lowering costs?

Western Dump cars are built strong, narrow gauge and standard gauge, in sizes ranging from 1½ cubic yards to 45 cubic yards capacity.

Ask us where the nearest Westerns are operated that you may see for yourself. Write for Catalog P-61.

WESTERN WHEELED SCRAPER COMPANY
Founded 1877

Earth and Stone Handling Equipment
AURORA, ILLINOIS

Guaranteed Equipment

FOR SALE OR RENT

GUARANTEE

All equipment repaired in our shops is furnished in guaranteed condition, subject to thirty days' trial in service.

REFERENCE

Any reliable contractor.

STEAM SHOVELS

1—Type "B" Erie, Shop No. 929, mounted on traction wheels, ¾-yd. dipper.
1—Type B Erie Shop No. 1219, mounted on caterpillar. ¾-yd. dipper.
2—70-C Bucyrus, Shop Nos. 1195 and 1197, 2½-yd. dippers.
2—70-ton Bucyrus Shop Nos. 977 and 1233, 2½-yd. dippers.
2—60C Bucyrus, Shop Nos. 1286 and 1388, 2½-yd.
1—45-C Bucyrus. Shop No. 1202. Railroad type, 1¼-yd. dipper.
2—Model 60 Marion, Shop Nos. 1301 and 2238, 2½-yd. dippers.
1—Model 75 Marion, Shop No. 2112, 2½-yd. or 4-yd. dipper.
1—Model 80 Marion, Shop No. 1312, 4-yd.
1—95-C Bucyrus, Shop No. 1235, 4-yd. or 5-yd. dipper.

STEAM SHOVEL PARTS

1—Boom for Marion 60 or 61 Shovel, length 35 ft., 22-ft. dipper arm, 1½-yd. dipper, long jack arms, etc.

SIDE DUMP CARS

26—16-yd. Western Air Dump Cars.
27—12-yd. Western Air Dump Cars, 19-ft. beds, box girder doors.
13—12-yd. Western Air Dump Cars, 19-ft. beds, box girder doors, vertical dump cylinders, 50,000 lb. capacity trucks.
37—12-yd. Western Air Dump Cars, Truss-Rod Doors, 26-ft. beds.
4—12-yd. Oliver Hand Dump Cars.
12—8-yd. Western, 36-in. gauge, double truck cars.
3—5-yd. K. & J. 36-in. gauge Side Dump Cars, steel draw sills and steel lined wood beds.
8—4-yd. K. & J. 36-in. gauge, steel draw sills, box girder doors.
1—4-yd. Western, 36-in. gauge, steel beam cars.
27—4-yd. Western 36-in. Gauge Cars.
8—4-yd. Continental 36-in. Gauge Cars.
43—1½-yd. Western 24-in. gauge.

LOCOMOTIVES—Standard Gauge

1—19x26 Baldwin 6-wheeled Switcher, with tender. Shop No. 48215. New 1918. Weight 62 tons. 180 lb. steam pressure.
1—19x24 Baldwin 6-wheeled Saddle Tank. Shop No. 49553, built 1918. Weight 67 tons, air brakes, 180 lbs. steam pressure.
1—18x24 Brooks 6-wheeled Switcher, with tender, Shop No. 1778. Wt., 50 tons.
1—17x24 Davenport 6-wheeled Switcher, with tender. Shop No. 1268. Steam pressure 180 lbs. Wt., 47 tons.
1—17x24 Schnectady 6-wheeled Switcher with tender. Shop No. 2956. Wt. 44 tons.
1—16x24 Vulcan 4-wheeled Switcher, with tender, Shop No. 1764. Steam pressure 180 lbs. Weight 40 tons.
1—16x24 Davenport 4-wheeled Switcher, with tender. Shop No. 860. Steam pressure, 170 lbs. Wt., 38 tons.
1—16x22 C. M. & St. P. Ry., Class J-2, 4-wheeled Switcher. Weight, 32 tons.
1—13x18 American Saddle Tank. Shop No. 55248, built 1916. Wt. 32 tons.
1—11x16 Davenport 4-wheeled Saddle Tank Locomotive. Shop No. 1027. Wt. 20 tons. Steam brakes.

36-IN. GAUGE

1—11x16 Davenport Dinkey. Shop No. 2027. New in 1925, used six weeks. Weight 21 tons.
1—11x16 in. Davenport Dinkey. Shop No. 710. Weight 20 tons.
2—10x16 Davenport Dinkies. Shop Nos. 1400 and 1417. Weight 19 tons.
1—10x16 Vulcan Dinkey, Shop No. 3266. New 1922. A.S.M.E. boiler. Weight 18-tons.
1—10x16 Vulcan Dinkey, Shop No. 1394. Weight 18-tons.
1—9x14 Vulcan Dinkey. Shop No. 1675. Weight 14 tons.

24-IN. GAUGE

2—7x12 Davenport Dinkies. Shop Nos. 1411 and 1524. Weight 9 tons.
1—6x10 Davenport Side Tank Dinkey. Shop No. 1307. Wt. 7 tons.

DRAGLINE EXCAVATORS

1—30-B Bucyrus Dragline caterpillars, Shop No. 3641, 35-ft. boom, 1-yd. Page bucket.
3—Class 24 Bucyrus Steam, Shop No. 3445, 3500 and 3671, skids and rollers, 85-ft. to 100-ft. booms; 3½, 4½ or 5-yd. Page buckets.
2—Class 14 Bucyrus, steam operated, either coal or oil burner. Shop Nos. 748 and 3706, caterpillars. 60-ft. booms, 2-yd. Page buckets.
1—Model 210 P & H, gasoline, Shop No. 1077, New 1920, 48-ft. boom, 1¼-yd. Page bucket, caterpillars.

CRANES

1—10-ton Industrial, 4-wheeled. Shop No. 1989. 40-ft. boom, bucket operating.
1—20-ton McMyler, 8 wheeled, Shop No. 388, 45-ft. boom, 1¼-yd. O. & S. clam.
1—Gantry Crane. New in 1919; 48-ft. boom, 15-ton cap. at 18-ft. radius; 7-ft. 10½-in. gauge, 12-ft. wheelbase, self-propelling. Base of boom 17 ft. above track. Bucket-operating drums. Wt. 50 tons.

MISCELLANEOUS

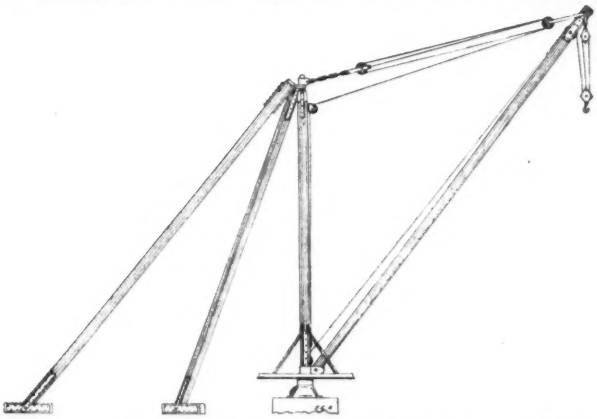
1—8-ft. Austin Giant Road Grader.
1—6x10 D.C., D.D. Lidgerwood Hoist, with 36x90-in. boiler.
1—6½x10 D.C., D.D. American Hoist, with butt strapped boiler.
1—7x10 D.C., D.D. Lambert Hoist, without boiler.
1—7x10 D.C., D.D. Flory Hoist, without boiler.
2—1½-yd. Page Dragline Buckets.
1—1½-yd. Brown Hoist Clam Shell Bucket.
4—Mead-Morrison 1½-yd. Clam Shell Buckets.
2—1¼-yd. O. & S. Coal Loading Clam Shell Buckets.

CLAPP, RILEY & HALL EQUIPMENT CO.
14 SOUTH CANAL STREET, CHICAGO

"WE BUY—REBUILD—SELL OR RENT"

ELECTRIC HOISTS AND DERRICKS

Following Equipment Available for Immediate Shipment F.O.B. Shooters Island, New York City, Chicago, Philadelphia and Pittsburgh



Specifications of American Electric Hoists and Derricks

HOISTS

Large quantity late model American double-drum with attached swinging gear, capacity 6000 lbs. on single line at 162 ft. per minute; either hand levers or levers banked in quadrant. Can furnish either 37 H.P., 440 or 220 volt, A.C., 60 cycle, 3 phase, alternating current, or 35 H.P., 220 volt, direct current, or can furnish without electrical equipment suitable for gasoline or belt drive.

CARS

12—36-in. ga. Continental, 4 yd., heavy duty, rebuilt like new.

15—Lakewood 30-in. ga., V shape, 1½ yd., all steel Dump Cars.

STEAM SHOVELS

3—78C late '23 models, 30-ft. boom, 19-ft. dipper stick, 3-yd. dipper, one on railroad trucks, two on caterpillars.

1—50B Bucyrus full revolving on caterpillars, 26-ft. boom, 17-ft. dipper stick, 1¾-yd. dipper new November, 1923.

1—Type "B" Erie on caterpillars, ¾ yd. bucket.

1—Type A-1 Thew, traction wheels, ⅞ yd. dipper, horizontal crowd.

2—Type "O" Thew, traction wheels, ⅝ yd. dipper, horizontal crowd—one shipper shaft.

DERRICKS

Large quantity late model American Stiff Leg Derricks, mast 14 x 14 x 40 ft., booms 14 x 14 x 60 ft., stiff legs 14 x 14 x 50 or 60 ft., sills if desired, with 12 ft. steel bull wheel, for hook work or bucket operation.

Large quantity late model American Stiff Leg Derricks, mast 16 x 16 x 40 ft., boom 14 x 14x80 ft., trussed with hog rods, legs and sills 14 x 14, with 16 ft. steel bull wheel, arranged for hook work or bucket operating.

LOCOMOTIVES

6—Porter std. ga., saddle tank, 14 x 22 cylinders, weight 42 tons, like new, only one year of service, shop Nos. 6768, 6769, 6770, 6771, 6772 and 6773.

1—Davenport std. ga., 20 ton, 10 x 16 cylinders, saddle tank. No. 1497.

3—Porter 36-in. ga., 18 ton, saddle tank, 10 x 16 cylinders, rebuilt like new. Nos. 4619, 4667, 6804.

3—7 ton, 24-in. ga., Plymouth, gasoline.

4—3 ton, 24-in. ga., gasoline, 2—Plymouth, 1—Whitcomb and 1—Fordson.

If you don't see listed what you want, write us. We may have it.

Equipment Corporation of America

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1460 Roanoke Bldg.
Phone Randolph 6586

Pittsburgh
860 Empire Bldg.
Phone Smithfield 1502

USED DIXDAM EQUIPMENT FOR SALE

May be inspected at Dixdam, near Burgin, Ky.

RAILROAD EQUIPMENT

6—38 Ton Porter Locomotives, Standard Gauge.
1—40 Ton Steel Center Sill, Standard Gauge, Flat Car.
1—30 Ton Standard Gauge Flat Car.
5—Standard Gauge Push Cars, Heavy Duty Flat Bottom.
1—Buda Speeder—Standard.
25—Continental 4 yd. 36-in. Gauge 2-way Dump cars.

PUMPS

1—Dayton Dowd Centrifugal Pump, Direct Electric Driven.
2—Gould Triplex 4-in. Pumps, Direct Driven, 15 Hp. Motor.
1—6-in. Morris Centrifugal Pump, Direct Steam Driven.
1—7½ x 4½ x 10-in. American Steam Pump.
1—Vogt 6 x 5½ x 7-in. Steam Pump.
1—Riley 6 x 6 x 10-in. Steam Pump, Pressure 125-lb.
1—Thomas 5-in. Single Suction, 3 stage Centrifugal Pump, direct connected to 125 Hp. Motor.
1—American 12-in. x 6-in. x 12-in. Steam Pump 200-lb. Pressure.
1—No. 6—3½-in. Pulsometer Pump.
1—3-in. Emerson Steam Pump, Shop No. 614.
2—6-in.x3½-in.x7-in. Riley Steam Pumps. Pres. 125-lb.
2—Novo Gasoline Pumps, 1500 gal. per hr.

STIFF LEG DERRICKS AND HOISTS

1—American Wood Derrick, 80 ft. Boom, 40 ft. Mast, 16 ft. Bull Wheel.
2—10 Ton Derricks 12x12x55 ft. Boom, 14x14x32 ft., Mast 12 ft.; Bull Wheel.
1—Wood Derrick, 32 ft. Mast, 80 ft. Boom with Electric D. D. Hoist and attached Swinger.
1—Wood Derrick, 32 ft. Mast, 80 ft. Boom, Stroudsburg Hoist Engine.
2—Small Wooden Hand Derricks.
3—Wooden Derricks, 55 ft. Boom, 32 ft. Mast, with American Electric Hoists, 37 Hp. Motor, 3 phase D. D. attached Swinger.
1—Wooden Derrick, 32 ft. Mast, 80 ft. Boom, Electric Hoist, Double Drum.
1—Byers D. D. Hoist Engine 5-in.x8-in. with Boiler.
2—Steel Derricks, 80 ft. Steel Beam Street Bros.' 3 drum 8¼x10 Engine with geared Swinger, capacity 10 tons.

ROCK DRILLS

2—No. 3½ Keystone Drills.
1—No. 5½ Keystone Drill.
8—Waugh Drills, Model 31, Column Drills No. 82.
6—Waugh Drills, Model 21, Derrick Drills.
1—Sullivan DW64 Column Drill.
1—Sullivan Tripod Drill.
1—Sullivan Jack Hammer D. D. 33.
2—Ingersoll-Rand Tripod Drills.
4—D. C. R. 23 Ingersoll-Rand Jack Hammers.
18—D. C. R. 430 Ingersoll-Rand Jack Hammers.
2—Hardsocg No. 60 Jack Hammers.
2—Ingersoll-Rand Calyx Drills, with Pumps, Class G. O., Nos. 2843 and 2844.
3—Ingersoll-Rand Calyx Drills, Class G 31.

STEAM SHOVELS

3—Type 78 C. R. R. Bucyrus Steam Shovels, Shop Nos. 4041, 4124, 3995. Equipped with: 3 yd. Rock Dippers, 30 ft. Boom, 19 ft. Dipper Stick, Moon Lighting System, 1½-in. Taylor Chain, 1 R. R. Traction, 2 Caterpillar Traction.

CABLE WAYS AND EQUIPMENT

2—Street Bros.' "Hawson" Type Cableways used as concrete Cableways—used.
6—Street Bros.' "Hawson" Type Cableways Automatic Dump Complete—2 used—4 new.
1—3 Ton Street Bros.' Cableway and Hoist Complete.
1—5 Ton Street Bros.' Cableway with Hoist Complete.

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Locomotives and cars of every type in serviceable condition.

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1—42"x48" Traylor Jaw
1—48"x36" Traylor Jaw
1—No. 8 Style "K" Gates
1—48" Symons Disc 1—7½ Austin
1—36" Symons Disc 1—No. 5 Austin
1—18" Symons Disc
1—No. 4 Gates, right hand drive
1—Gates 7x10, extra jaw plates
1—Telsmith No. 2 Reduction

CRANES

1—Browning 30 ton, 55 ft. boom
1—Browning 20 ton, rebuilt
1—10 ton O. & S., traction rebuilt
1—Byers 10 ton, new 22 H. P. boiler
1—Byers Truck Crane, 25 ft. boom

SHOVELS

1—Bucyrus 50-B, caterpillar, comb
1—Marion Model 37, caterpillar
1—Marion Model 36, caterpillar
1—Marion Model 28, two booms

BOLL MACHINERY COMPANY
140 SOUTH DEARBORN STREET, CHICAGO

FOR SALE

1—¾ yd. combination caterpillar shovel and dragline.
2—Northwest 104, 1 yd. gas caterpillar drag-line machines.
1—class 14 Bucyrus, skid and roller drag-line.
20—12 yd. Western dump cars.
30—16 yd. Western dump cars.
Miscellaneous railroad type Shovels, class 9½ and 24 Drag-lines and other equipment. Send for list.

F. E. HOUCK

9 S. Clinton St., Chicago

Tel. Main 1417

FOR SALE OR RENT

STEAM SHOVELS

1—70-C Bucyrus. Shop No. 1749. Standard gauge, railroad, 2½-yd. dipper.

1—Model 60 Marion. Shop No. 1463. Standard gauge, railroad 2½ yd. dipper (butt strap boiler).

1—18B Bucyrus, revolving. Shop No. 1764. Traction wheels, ⅞-yd. dipper.

1—Type B Erie Revolving Steam Shovel, traction wheels, standard boom, ¾-yd. dipper.

1—Model 212 Marion (revolving). Shop No. 4620. New Sept. 1923, mounted on trucks, 55-ft. boom, 34-ft. dipper stick, 1¾-yd. dipper.

1—Model 28 Marion, standard revolving. Shop No. 2804, traction wheels, ⅝-yd. dipper.

STEAM SHOVELS—Cont.

1—Little Giant Railway type, standard gauge, equipped with standard boom, 1¼-yd. dipper.

CRANE

1—Northwest, Model 105, gasoline, standard caterpillar, 40-ft. boom, 1 yd. clam shell bucket.

CYCLONE DRILLS

2—No. 14 Junior Gasoline Traction Big Blast Hole Drills. 5-in. bits. Late machines.

DRAGLINES

1—Class 210 P & H Gasoline. No. 1349, on caterpillars. 76-hp. Twin City Engine. 48-ft. boom, 1-yd. bucket.

DRAGLINES—Cont.

1—Class 14 Bucyrus, steam operated, on caterpillars, 60-ft. boom, ¾-yd. Page bucket. Shop No. 3706.

1—Class 24 Bucyrus, steam operated, skids and rollers, 100-ft. boom, 3½-yd. bucket.

1—Class 24 Bucyrus Electric Driven, skids and rollers, 100-ft. boom, 3½-yd. bucket.

1—No. 2 Monighan, steam operated, skids and rollers, 70-ft. boom, ¾-yd. bucket.

MISCELLANEOUS

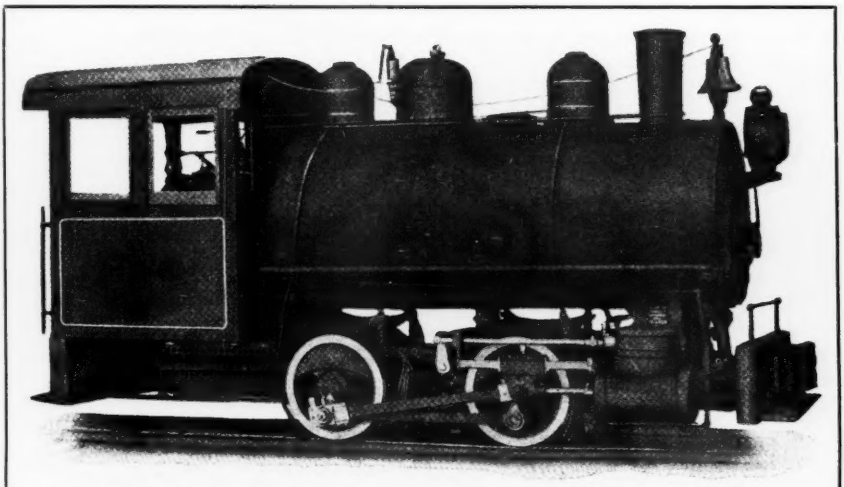
1—¾-yd. dipper for Model 18 Osgood Shovel.

The above list is constantly changing. No matter what your machinery requirements are, write us—we may have it.

EARTH & ROCK EQUIPMENT CO., 29 South La Salle Street

Chicago, Ill.

Successors to: BECK & BABB



2—Standard Gauge 11" x 16"—22 ton, 4 Driver saddle tank locomotives, 170 pounds steam pressure; steam brakes. Completely rebuilt. Immediate shipment.
HAVE OTHER LOCOMOTIVES IN STOCK, REBUILT AND READY, 5 to 125 tons, narrow and standard gauge; various types.

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1—Raymond Pulverizer, five roller, low side mill.
1—Pratt Box Car Loader.
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2—18x24 Single Roll Crushers.
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1—G. L. Stuebner Iron Works End Discharge Car.
1—Byers Model 3, Electric Auto Crane, Road Wheels, 26 ft. Boom and ½ yd. Clam Shell Bucket.
1—Maddox Foundry Side Dump Iron Car.
1—Raymond Bros. Tubular Collector and Piping.
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1	40	Westinghouse, MW, slip ring.....	850
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1	50	Fairbanks-Morse, type BV, slip ring..	1200
1	50	Allis-Chalmers, type AN.....	1160
1	50	G. E., type I, form M, slip ring.....	900
1	50	Westinghouse, type CS.....	870
1	50	Westinghouse, CCL	680
1	50	G. E., form K.....	600
1	60	G. E., form KT	900
1	75	G. E., form K, 220 v.....	1800
1	75	G. E., form K, 2300 v.....	1800
2	75	G. E., type I, form M, slip ring.....	860
1	75	Fairbanks-Morse, type BV, slip ring..	690
1	75	G. E., form K.....	600
1	75	Westinghouse, type CW, slip ring.....	435
1	100	Westinghouse, type CS.....	870
1	100	Allis-Chalmers, slip ring, 2200 v.....	865
2	100	Westinghouse, type CW, slip ring....	350
1	250	Westinghouse, type C	850
1	250	Fairbanks-Morse, type HV, slip ring.	600
2	250	G. E., type I, form M, slip ring.....	385
1	300	G. E., type I, form M, slip ring....	1200

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1—396 ft. Class WB-2 Sullivan 2 stage
1—534 ft. X-2 Ingersoll steam compressor
1—558 ft. Norwalk 2 stage
1—558 ft. Class WB-2 Sullivan 2 stage
1—628 ft. Class A Ingersoll Sergeant
1—734 ft. Imperial X-2 Ingersoll-Rand
1—1056 ft. Imperial X-3 Ingersoll-Rand
1—2394 ft. Imperial X-2 Corliss Ingersoll-Rand

The above all designed and built for 100 to 150 lb. steam pressure and to deliver air at 80 to 120 lb.

1—16x16x14 XB-1 Imperial Ingersoll-Rand belt driven compressor built for 30 lb. terminal air pressure. Capacity 1000 ft.

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1—14x36 R.H. Hamilton Corliss
1—14x36 L.H. Murray Corliss
1—18x36 L.H. Murray Corliss

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1—Wm. A. Box Iron Works Company Electric Hoister, No. 80—16688; Rope Speed 700 ft. P.M. Pull 5500 lb., double drums 42x29 in. Complete with 112 H.P. G.E. Motor 3 ph. 60 cy. 440 v. 690 r.p.m. (This equipment practically new.)

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Three No. 1, Two No. 1½ and One No. 2 Sturtevant Rotary Fine Crushers.

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Two No. 3 Gates, One No. 4 Gates, Two No. 5 Gates, Two No. 6 Gates & McCully, Two No. 7½ Gates and Austin, Three No. 8 Gates & Traylor, One No. 9 Gates Gyratory Crushers.

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Three 9"x15", One 10"x20", Two 12"x24", One 15"x30", One 18"x36", One 24"x36", and One 36"x42" Jaw Crushers.

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Two 10"x16", Three 10"x30", Two 16"x36", Two 16"x42", and One 24"x54" Crushing Rolls. Swing hammer mills and other types.

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Two 3'x20', Three 4'x30', One 5'x25', One 5½'x40', Two 6x60', and One 7'x60' Direct Heat Rotary Dryers. One 5'x25', One 6'x30' Ruggles Coles type "A" and one 4'x20' Ruggles Coles type "B" Double Shell Rotary Dryers.

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One 4'x40', One 5'x50', Two 6'x60', One 6'x125', One 7'x60', Rotary Kilns.

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600—50-Ton All Steel Double Hopper Cars.

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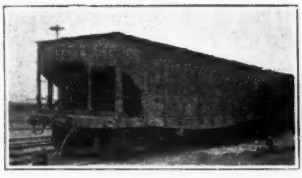

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CRUSHERS	LOCOMOTIVES	WAGONS
DERRICKS	MIXERS	PAVERS
DITCHERS	MOTORS	PUMPS

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BROWNHOIST No 9359, 7-ft. gauge, 4-wheel, ASME boiler, double drums, 44' 6" boom, complete with 1½ cu. yd. clamshell. Like new. Used less than 6 months.

OHIO 20-ton cap., 50' boom, double drums, 8-wheel MCB, Massachusetts boiler. One year old. First class condition.

McMYLER 14' 6" gauge, steam operated, full revolving, 64 ft. boom, 2½ yd. clamshell bucket.

Philip T.
KING
"The Crane Man"
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1—20-ton, 8-wheel, OHIO Locomotive Crane, Shop No. 3631, new 1924, A.S.M.E. and Mass. boiler, 50 ft. boom; bucket operating; M.C.B. trucks, perfect condition.

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25—12-yd. std. gauge, WESTERN, two-way Hand Dump, Heavy Duty, STEEL DRAFT BEAMS, 19 ft. beds, Box Girder Doors, M.C.B. trucks, overhauled, first class condition.

25—4-yd. 36 in. gauge, KOPPEL, two-way side dump, new 1924, Heavy Duty, STEEL DRAFT BEAMS, like new.

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177 ft. Ingersoll, "ER-1."
360 ft. Chicago, "NSB" with motor complete.
528 ft. Ingersoll, "ER-1."
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1190 ft. Ingersoll, "X-2."
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1—No. 4½ Champion Jaw Crusher Price, $750.00.

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1—Stiff leg derrick, Select Oregon fir, 100 H. P. Lidgerwood hoist, 30 H. P. swinger, mast 48 ft., boom 72 feet, complete with irons, cable, buckets, etc.

1—Class 14 Bucyrus steam dragline, with 2-Yd. bucket, 60 foot boom with 15 foot extension.

1—Model 40 Marion railroad type steam shovel, Shop No. 1049.

1—Model 40 Marion railroad type steam shovel, Shop No. 2282.

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27 H. P. Northern Fort Wayne compound wound D.C. Generator, 125 V., 160 amp., 20 K. W., 1350 R.P.M.

3½" Platt Turbine Pump.

2-cylinder double end single stage air compressor, 140 cu. ft. capacity, also one with 200 cu. ft. capacity.

125 H. P. McEwen Steam Engine, direct connected to 75 KW-DC Generator.

75 K. W. Ridgway 600 amp., 125 volt, 260 R.P.M., with 125 H.P. Steam Engine connected.

14"x18"x36" Minneapolis Tandem Compound Corliss Steam Engine.

200 K. W. Western Electric 125 V., 1600 amp., 90 R.P.M. direct current compound wound generator.

Get prices and make arrangements for inspection.

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1—21" gauge Gasoline Locomotives
3—Miles of 24" gauge Industrial Track
62—Batch Box Cars
124—Batch Boxes

Above is strictly first class

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1302 Fulton Bldg., Pittsburgh, Penna.

For Sale or Rent

LOCOMOTIVE CRANES

1—No. 8 Browning, 8 wheel, 50 ft. boom
1—10-ton Bay City, 4 wheel

STEAM SHOVELS

1—Type "B" Erie on caterpillars
1—14B Bucyrus on caterpillars
1—No. 20 Marion on trucks

MISCELLANEOUS

Hoisting Engines, Pumps, Derricks, Clamshell Buckets, Concrete Mixers.

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CRANES

McMyler 25 ton 50'-70' Boom.
Erie B Caterpillar 36' Boom.
O. & S. 12 ton Cat. Gas., 40'-50' Boom.

SHOVELS AND DRAGLINES

Marion 36 Caterpillars high lift.
Marion 36 Caterpillars 1½ yd.
Osgood 18 Combination Caterpillar
Osgood 29 Caterpillars, 1¼ yd. Dipper.
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Bucyrus 20 B Caterpillar, ¾ yd.
Bucyrus 14 Dragline 60' Boom 2 yds.

CRUSHERS

11x20 Aurora Portable with Bucket Elevator, Screen and Portable Bin.
No. 4 Gates Gyratory.

Locomotives, Boilers, Air Compressors, Cars, Draglines, Road and Other Equipment.

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Monadnock Building Chicago, Ill.

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1—Byers Model 10, caterpillar, gas crane, No. 1987, with 38' boom, and ¾ yd. clam shell bucket.
1—Erie Crane, No. 1042 road wheels, 36' boom, with boom hoist.
1—O. & S. Locomotive Crane, 15- 18 ton capacity. No. 41202 with double drums and 55' boom and outriggers.
1—McMyler 25 ton crane, type H, double drums, 50' boom with 20' extension and outriggers.
2—Thew Steam Shovels Nos. 2146 & 2269, with road wheels, both late model, high lift shovels with ¾ yd. dippers.
2—Plymouth Gas Locomotives, 24" ga.

WRITE FOR BULLETIN 13

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All in first class condition. To be sold at a sacrifice.

2—Revolving Screens, 20 ft. by 60".
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3—10 x 6 x 10 hor. dup. piston Pumps.
1— 8 x 8 Buffalo Forge Upright Engine.
1— 6 x 6 Donegan-Swift Upright Engine.
1—Crocker Wheeler 18 Kw Generator.
1—200 H. P. Scotch Boiler, 125 lb. steam.

MURRY-PERRY, INC.
Port Jefferson, Long Island, N. Y.

3—3½ yd. SHOVELS

Railway Type, Mang. Dippers
Crushers, #10, 9, 8, 7½, 6, 5, 4, 3, Roll Crushers
84x72, 36x60, 54x24, 18x30 Jaw Crushers
22x52", 36x42", 42x48", 20x24", 15x36" DISC CRUSHERS, 48", 36", 24", 18"
120 H.P. Gasoline Engine
(with Power Take Off)
Kilns, Pulverizers, Elevators
New 78x20 and 78x25 Screens and others.
Ross Power Equipment Co.
13 South Meridian St., Indianapolis, Ind.

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2—Symons 48" disc crushers with extra parts equal to new.

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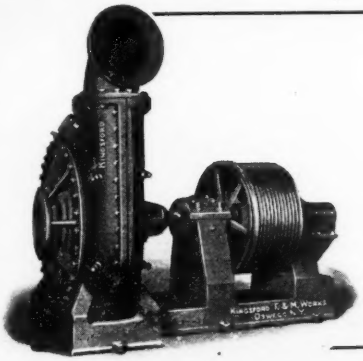

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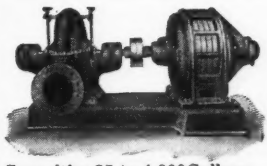

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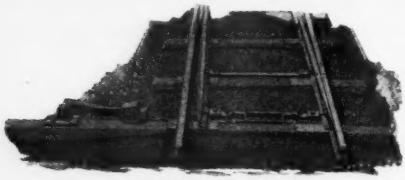

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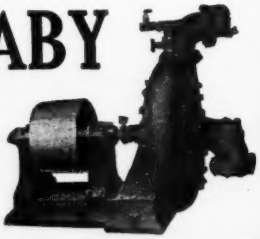

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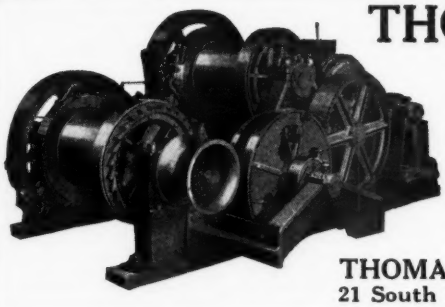

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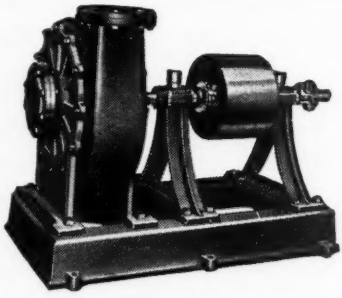

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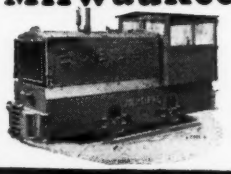

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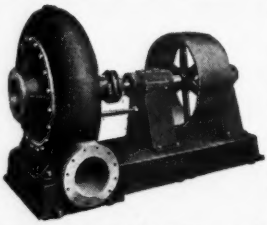

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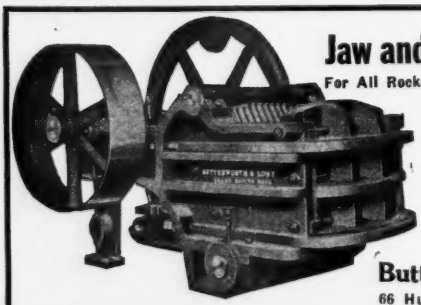

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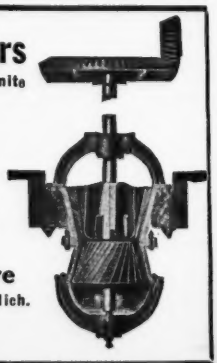

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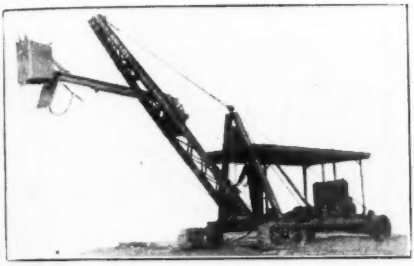

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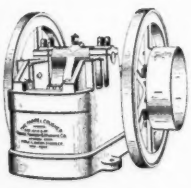

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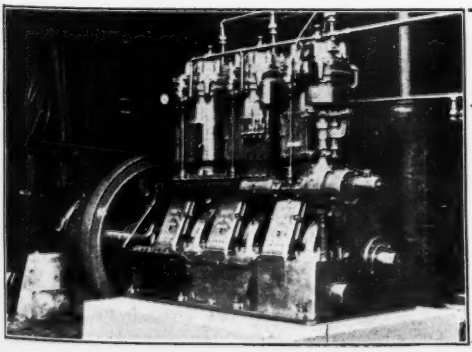

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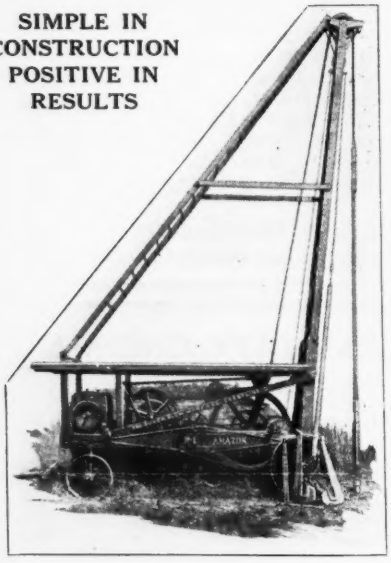

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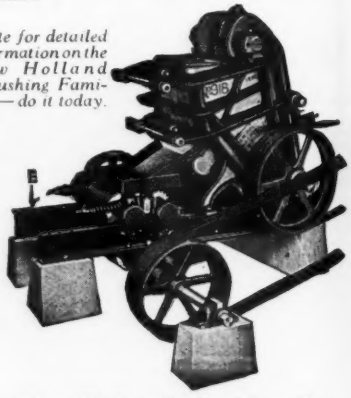

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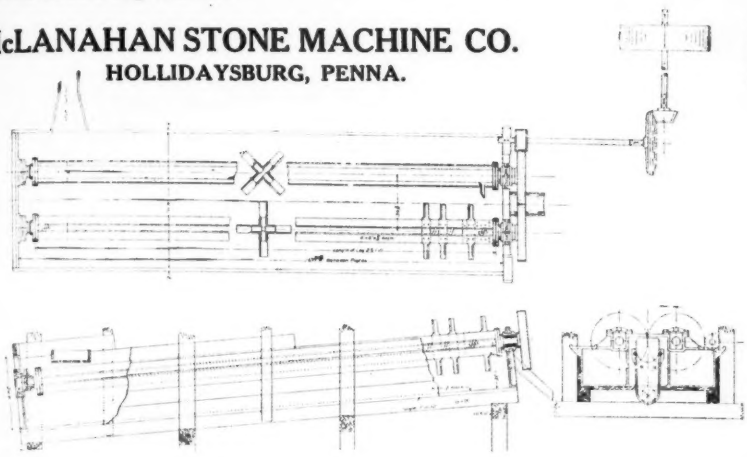

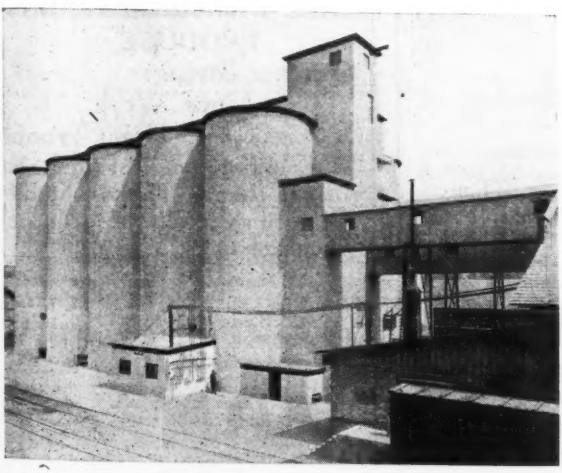

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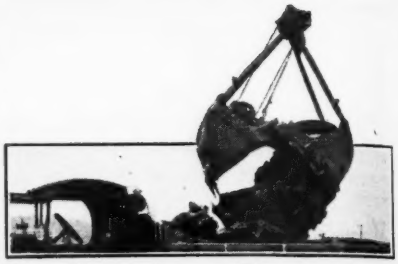

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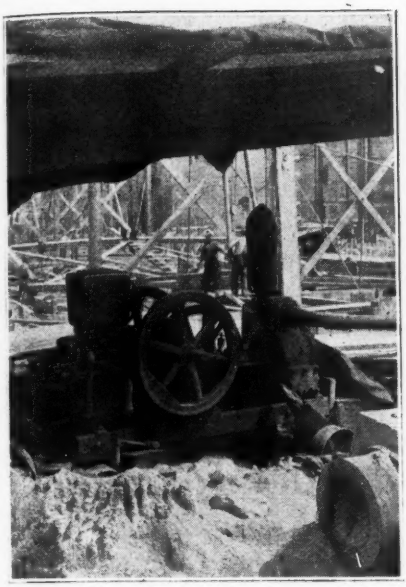

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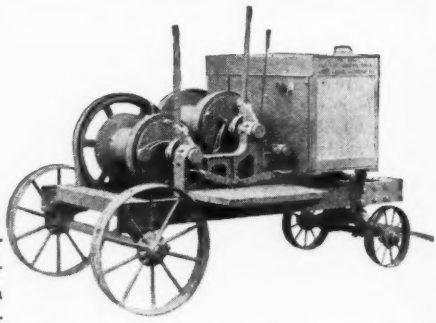
SPEED STRENGTH CONTROL



THE Ebel Drag Line Hoisting Engines have these combined qualities which solves a great problem and makes a practical purchase for its owner.

The models AB and BC, Hoists are mounted for portable work, adapted to handling a 1/3 to ½ cubic yard bottomless scraper.

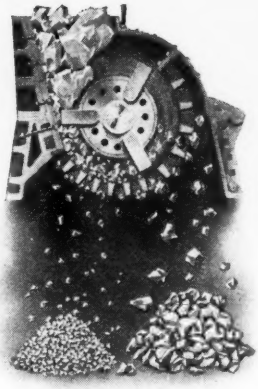
We will be glad to give you in detail information regarding the Edel Hoists and Power scrapers, which are built to suit your job at a price you can afford to pay.

LANSING MOTOR & PUMP CO.

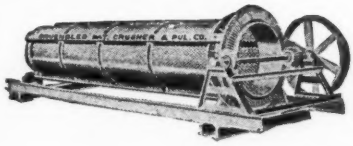
Home Office, 326 S. Hosmer St., Lansing, Mich.

Eastern Office, 302 Broadway, New York City

Gruendler Service is Efficient, Productive and Economical—



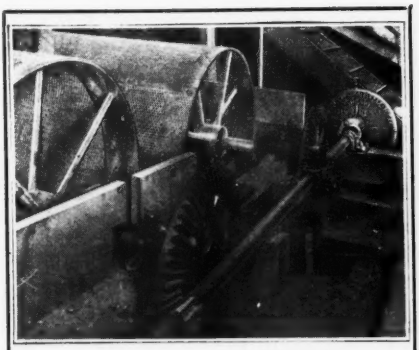
That is what operators say whose plants are Gruendler Equipped. Less labor, less equipment, greater tonnage, and uniform product are secured at lowest cost per ton. Gruendler crushers, revolving screens, elevators, hoists, and plant design have solved the producers' production problems.



Plants in any capacity from 3 to 6,000 tons daily. They are the result of experience and knowledge. Their exceptional ruggedness assures year 'round consistent performance with minimum upkeep.

Gruendler equipment and service will solve *yuor* production problems too. Consult with our engineers who will gladly analyze your crushing or pulverizing problem.

Gruendler Patent Crusher & Pulverizer Co.
908 North Main St.
ST. LOUIS, MISSOURI



Insured
Against Shutdowns

The installation pictured above shows a Foote IXL Reducer Operating Stone Screens in the Bellwood Quarry of the Central Lime & Cement Co., Hilsdale, Ill.

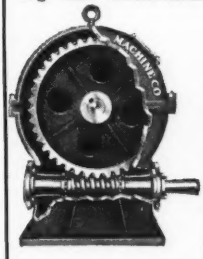
This is only one of the many uses found in the Quarrying Industries and Cement, Lime and Gypsum Plants for these compact, enclosed, safe, efficient Reduction Units.

For safe, dependable, economical and efficient service—you can always rely on

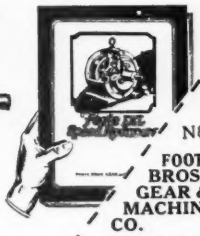
IXL SPEED REDUCERS

to drive screens, mixers, conveyors, elevators, pumps, mills, or any similar equipment.

Let us show you how IXL Speed Reducers will help you to cut your operating and maintenance costs.



Send for our Free Speed Reducer Book



N86

FOOTE BROS. GEAR & MACHINE CO.
235-245 N. Curtis St., Chicago, Ill.

FOOTE BROS. GEAR & MACHINE CO.
235-245 N. Curtis St., Chicago, Ill.

Signed .....

Address .....

CYCLONE NUMBER FOURTEEN BIG BLAST HOLE DRILLS

Whatever success Cyclone No. 14 Big Blast Hole Drills have attained in the quarry industry during the fifteen years of their existence has been due to close adherence to the following ideals and principles:

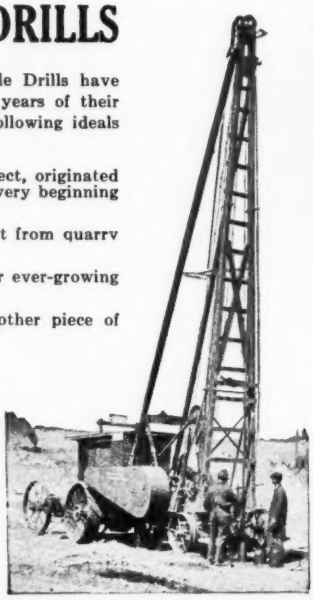
1—Starting with a design that was basically correct, originated after a close study of the requirements at the very beginning of the use of well drills in quarrying.

2—Always welcoming suggestions for improvement from quarry operators.

3—Keeping in close touch with the field and their ever-growing requirements.

4—Never holding the idea that a drill or any other piece of machinery could be perfect or faultless.

The story of the development of Cyclone No. 14 drills is completely told in our 100-page catalog B-45. It also contains 40 pages of cost and operating data on quarry drilling and blasting. Ask for a copy.



THE SANDERSON-CYCLONE DRILL CO.

Orrville, Ohio

Eastern & Export Office:
30 Church St., New York City

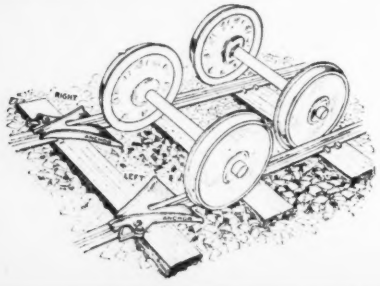
Rerail in a jiffy with

"ANCHOR" RERAILERS

When your locomotives or cars jump the track, "Anchor" Rerailers will jump 'em back on again — quickly and easily!

Every locomotive should be equipped with a pair. They save you many times their cost.

Patented 1924



Used all over the world

Easily handled by one man

GET 'EM NOW!

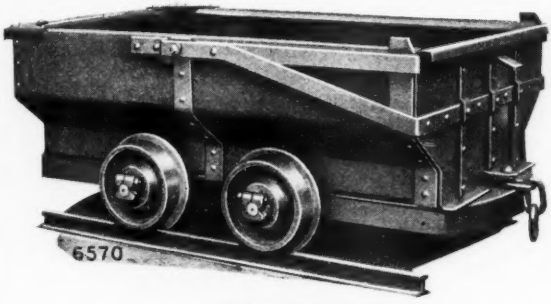
Manufactured by

T. H. EDELBLUTE CO.

Wabash Building

PITTSBURGH, PA.

EASTON QUARRY CARS



TYPE 6570

Bulletin 21 shows other types of quarry cars.
"Quarry Car Practice" published every now and then.

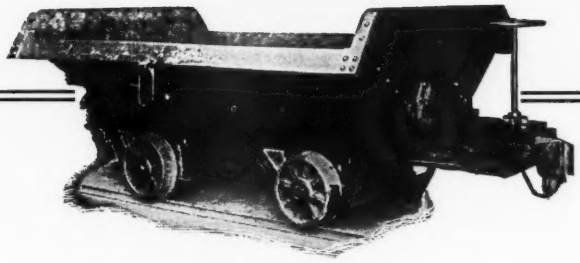
Confidence—

is founded upon fair dealing, integrity, efficient product, and mutual benefit. It is created through giving the best that is in you, and demonstrating unwavering reliability and quality.

EASTON CAR & CONSTRUCTION CO.
KANSAS CITY, MO. and EASTON, PA.

New York Chicago Pittsburgh Philadelphia San Francisco

EASTON CARS
FOR EVERY PIT MINE & QUARRY



QUARRY CARS THAT ENDURE

Under Most Abusive Loading Conditions

ATLAS CARS are designed to reduce haulage costs and last longer

"They do both—Why not Investigate"

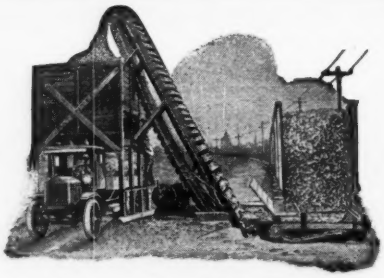
Engineering Service Especially Developed in Quarry Car Design

THE ATLAS CAR & MFG. CO.
1140 Ivanhoe Road CLEVELAND, OHIO

Quarry Cars, Rocker and Gable Bottom Cars, Special Cars of All Kinds

Here's What We GUARANTEE

When equipped with proper size feeder, the SUNBURY Automatic Unloader



Will load or unload a 50-ton car in 90 minutes!

The SUNBURY Automatic Unloader

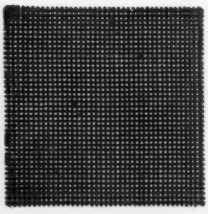
And one man can handle it. The first cost is reasonable and its return from the standpoint of its being able to substantially increase your profits makes it a very profitable investment.

Its automatic feature is important and will commend it to you. It is simple in construction, strongly built and economical in operation.

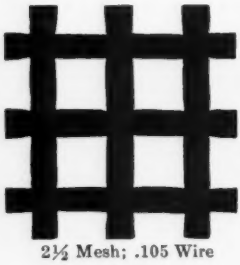
We will be pleased to send you an illustrated descriptive circular.

THE SUNBURY MANUFACTURING CO.

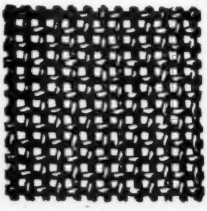
SUNBURY, OHIO



40 Mesh; .0135 Wire



2½ Mesh; .105 Wire



12 Mesh; .047 Wire

SERVICE! is the one thought behind every operation in the manufacture of—

"CLEVELAND" Double-Crimped Wire Cloth

Uniform fineness and long service will be assured by its use in screening SAND, GRAVEL, CRUSHED STONE AND CEMENT.

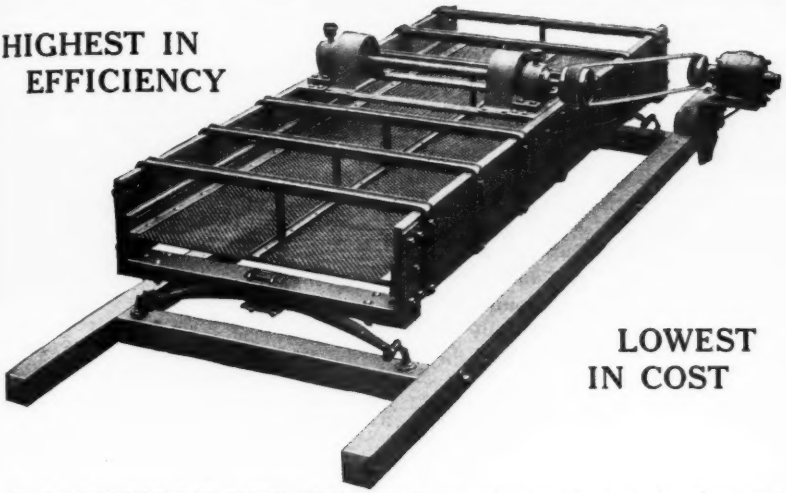
Large stock always on hand; special mesh manufactured to suit requirements at right prices.

THE CLEVELAND WIRE CLOTH & MFG. CO.

3579 EAST 78TH STREET

CLEVELAND, OHIO

HIGHEST IN EFFICIENCY



LOWEST IN COST

In the UNIVERSAL VIBRATOR you have a thoroughly tested and proven product that will surprise and please you with its superior performance.

UNIVERSAL VIBRATING SCREEN CO.

RACINE — — WISCONSIN

See P&Q HANDBOOK Page 426

Perforated Metal Screens

FOR STONE, SAND, GRAVEL, ETC.

Plates flat; rolled to diameter or radius for revolving and conical screens butted or lap joints.

Elevator Buckets

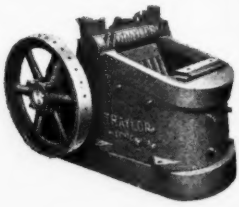
in all styles and sizes

HENDRICK MFG. CO., 39 Dundaff Street CARBONDALE, PA.

30 Church St., New York City — 954 Union Trust Bldg., Pittsburgh, Pa.

TRAYLOR

Bulldog Jaw Crushers



The design of the Traylor Bulldog Jaw Crusher eliminates most troubles because of the following features:

Simple Pitman of maximum strength
Frictionless three-bearing toggle system
Self-aligning Pitman shaft bearings
Scientifically reinforced frame
Easy accessibility to all moving parts

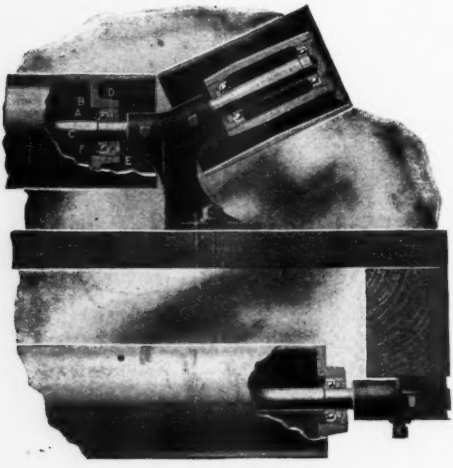
Traylor Engineering and Manufacturing Company
ALLENTOWN, PENNA.

NEW YORK 30 Church St. — CHICAGO 1414 Fisher Bldg. — LOS ANGELES I. W. Hellman Bldg. — SEATTLE 815 Alaska Bldg.
SALT LAKE CITY, 100 W. 2nd South St. — TIMMINS, ONTARIO, CANADA, Moore Block

Export Department, 60 Water St., New York City—Cable Address: "Forsaltra"
International Machy. Co., Santiago, Chile. — W. R. Grace & Co., Lima, Peru.
International Machy. Co., Rio de Janeiro, Brazil. — British & Foreign Machy. Co., London.
Fraser & Chalmers (S. A.), Ltd., Johannesburg, S. A. — S. Oppenheim & Co., Ltd., Rangoon, India.
General Electric (S. A.), Buenos Aires.

European Works: Ghent, Belgium, Usines Carels Freres.

ELIMINATE IDLER FRICTION



Conweigh Ball Bearing Idlers are smooth running, and durable, being made of hardened steel well reinforced. They give easy access for lubrication.

More and more the demand in plant equipment is for intensive development and greater perfection in details. Conweigh Ball Bearing Troughing and Return Idlers represent a detail improvement which affects the whole conveying system of a plant. Because of the smooth, easy service they give, belt conveyors operate with far greater efficiency.

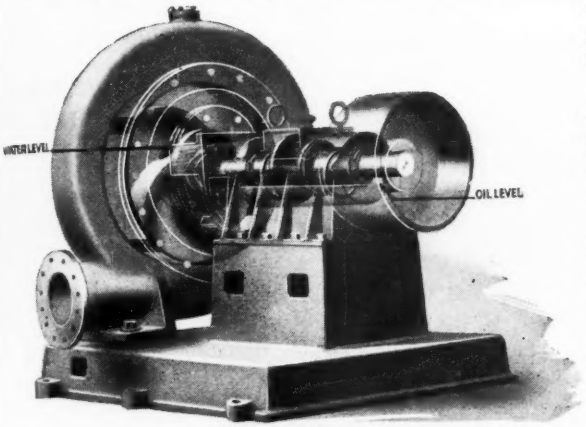
Get complete details on "Conweigh" Idlers. Made in all sizes. Write today.

We are the original inventors and builders of belt conveyors equipped with ball bearing idlers.

Write for detailed information

THE CONVEYING WEIGHER COMPANY
90 West Street — **ENGINEER & CONTRACTOR** — **New York**

Tampa Dredging Pumps Are The Best



The curves of our runner flights are shaped right.

Our square shaped shell avoids spiral motion in discharge.

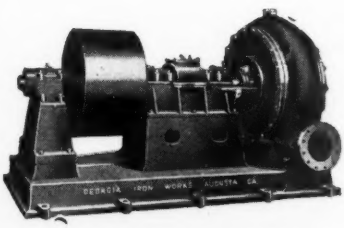
Our water seal makes air leaks impossible.

Our oiling system eliminates lubricating troubles.

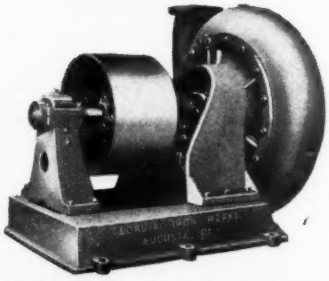
Our yardage production is unequaled.

We manufacture
4", 6", 8", 10", 12" and 15"
either direct connected to motor or belt driven

TAMPA SHIPBUILDING & ENGINEERING CO.
TAMPA, FLORIDA
WRITE FOR PRICES, DESCRIPTION and OUTLINE BLUE PRINT



Heavy duty belt driven sand and dredging pump built in 8", 10", and 12" sizes.



Overhanging type belt driven sand and dredging pump. Built in 6" and 8" sizes.

SAND PUMPS

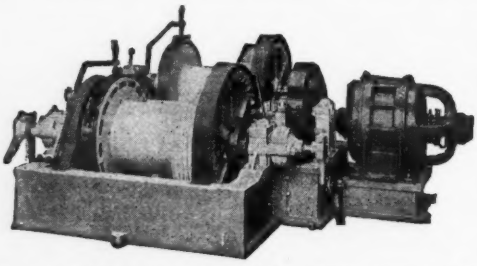
The accompanying cuts show two very popular types of belt driven units. These pumps are also built with bases for direct connection to motor.

Send for illustrated catalog showing our complete line of this equipment including flanged pipe fittings and hydraulic guns.

GEORGIA IRON WORKS
AUGUSTA, GA.
Established 1891

LIDGERWOOD HOISTS

STEAM—ELECTRIC—BELT DRIVE—GASOLINE



Types to suit all contractors' uses

Illustration shows our Two-Speed Electric Hoist, built in sizes up to 200 H.P., *for operating slack line drag bucket excavators* up to and exceeding two-yard capacity.

A breakdown of the engine stops your entire operation; reduces your output; increases your cost per yard. *LIDGERWOOD HOISTS have strength in every part to work continuously without breakdowns.*

HOISTS — CABLEWAYS — DERRICKS

LIDGERWOOD MFG. CO., 96 Liberty St., New York

Chicago; Pittsburgh; Philadelphia; Detroit; Los Angeles; Seattle; Tacoma; Portland, Ore.; Brown-Marx Bldg., Birmingham, Ala. **Sales Agents:** Norman B. Livermore, San Francisco; Woodward, Wight & Co., New Orleans, La.; John D. Westbrook, Inc., Norfolk, Va.; Canadian Allis-Chalmers, Ltd., Toronto. **Foreign Offices:** Sao Paulo, Brazil; Rio de Janeiro, Brazil; London, Eng.

Take the "Dirt" Out of Dirt Moving

Right now when stripping operations are slowing up under the heat is the time to install a Miami Fordson (one-man) Power Scraper. It never gets tired—never gets hot—but runs day in and day out, moving a minimum of 100 yards every ten hours on a two hundred foot haul, one way.

All this is accomplished by one man with one Scraper unit for less than twenty cents per yard.

Costs are slashed squarely in half with, this modern equipment. You will be surprised at the small initial investment, low depreciation and low operating costs.

Let us tell you more about it. Write today.

THE MIAMI TRAILER SCRAPER CO.

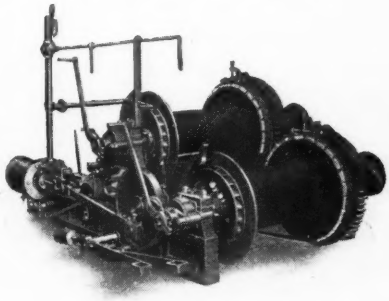
615 S. Clay Street **Troy, Ohio**

MIAMI FORDSON one man power **SCRAPER**

Reg. U. S. Pat. Off.

"O & S." STEAM HOISTS

We build a line of Double Cylinder Steam Hoisting Engines for Quarrymen, Contractors and Bridge Builders, which are equal to any Hoist on the market. In capacity they range from 750 to 11,000 pounds. Built with Single, Double or Triple Tandem Drums, with and without Boom-Swinging Attachment. Furnished with or without Boiler.



Write for Bulletins Nos. 213, 215, 231 and 233.

Manufactured by

ORR & SEMBOWER, Inc., Reading Penna.

ESTABLISHED 1885

50 Church St.
NEW YORK CITY

208 N. Clinton St.
CHICAGO, ILLINOIS

"Pioneer Bucket Loading"

THE PIONEER BACK DUMP BUCKET

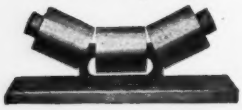
is one tool which is always on the job—which seldom requires repair—which is so simple as to be very nearly foolproof—and which does its work very much faster than any other slackline bucket yet devised.

If you want the bucket which reduces your troubles and increases your profits—drop us a line—ask us to show you.

PIONEER BUCKET COMPANY

(Successors to The Mansfield Engineering Company)

1011 Fletcher Trust Bldg., Indianapolis, Indiana



CALDWELL VALUE

THE real worth—or value—of an article is predetermined by the ideals of the makers.

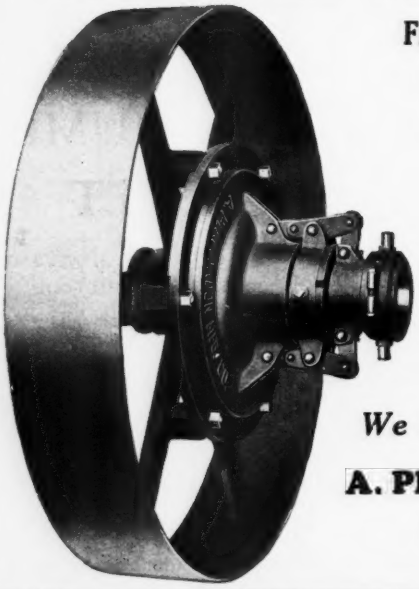
Users of Caldwell products have never questioned the presence of superior value (quality) in this equipment. Once used they know this value for what it is. Self interest prompts them to continue specifying Caldwell products over long spans of years.

If you need elevating, conveying or transmission machinery promptly, address Caldwell or the nearest Link-Belt office.

H. W. CALDWELL & SON CO.
LINK-BELT COMPANY, OWNER
Chicago, 1700 S. Western Ave.; Dallas, Texas, 819 Main St.; New York, 2676 Woolworth Bldg.

CALDWELL

IMPROVED PLAMONDON

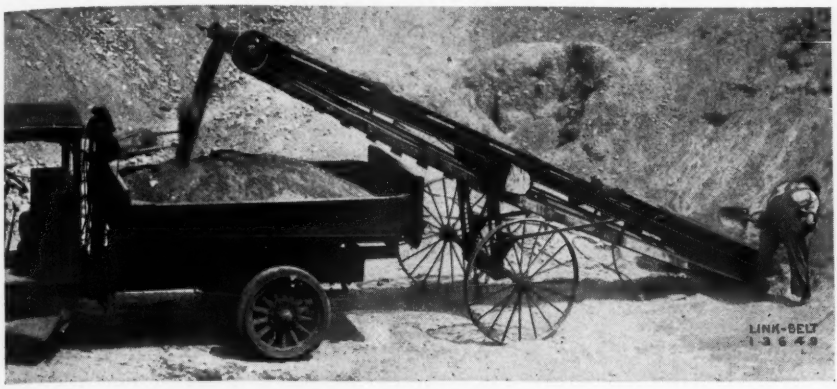


FRICTION CLUTCH PULLEYS
HEAVY WORKING PARTS
Now Made of Steel.

DEPENDABLE GEARS
CUT or CAST TEETH
STEEL or CAST-IRON
GENERAL MACHINE REPAIRS
PATTERN SHOP — FOUNDRY

We Can Give You Service

A. PLAMONDON MFG. CO.
5301 S. Western Blvd.
CHICAGO



For Reliable Performance Use the "Cub" Loader

YOU cannot make money by wasting hours in inefficient loading and unloading by hand labor.

The Link-Belt "Cub" Portable Belt Conveyor, with 2 or 3 phase, 60 cycle motor, 21 ft. conveyor length, 18 in. wide belt, shown above, and our various types of Portable Bucket Loaders, are designed to eliminate the waste of time and labor.

Another type of Link-Belt Loader. The type C Bucket Loader handles sand, gravel and pebbles up to 2" diameter.

They supply their owners with a quick, cheap and efficient means of handling sand, gravel or similar materials. These machines do the work of five or more men, and pay for themselves through the saving effected, in a comparatively short time. They are strong, rugged and durable. The initial cost is low and the upkeep slight.

See one of our portable loaders in operation.

LINK-BELT COMPANY

Leading manufacturers of Elevating, Conveying and Power Transmission Machinery 2216

PHILADELPHIA, 2045 Hunting Park Ave.
INDIANAPOLIS, 200 S. Belmont Ave.
CHICAGO, 300 W. Pershing Road
Offices in Principal Cities

LINK-BELT

THIS YEAR LINK-BELT IS FIFTY YEARS OLD

Famous Portable Loaders

DEPENDABLE POWER FOR EVERY PURPOSE

Coast to Coast Service

As its final provision for the continuous performance of every Red Seal power plant, Continental follows the motor out into the field where it is to operate and through a complete chain of parts depots makes it possible to supply genuine replacement parts in every section of the United States.

Even in remote localities there need not be a delay of more than *eight hours* when a replacement part is needed. Naturally such service facilities emphasize the value of Red Seal Motors as industrial equipment where continuous performance and economical maintenance are of prime importance.

Put Your Power Problems Up to "Power Headquarters"

CONTINENTAL MOTORS CORPORATION

Offices: Detroit, Mich., U.S.A. *Factories:* Detroit and Muskegon

Continental Motors